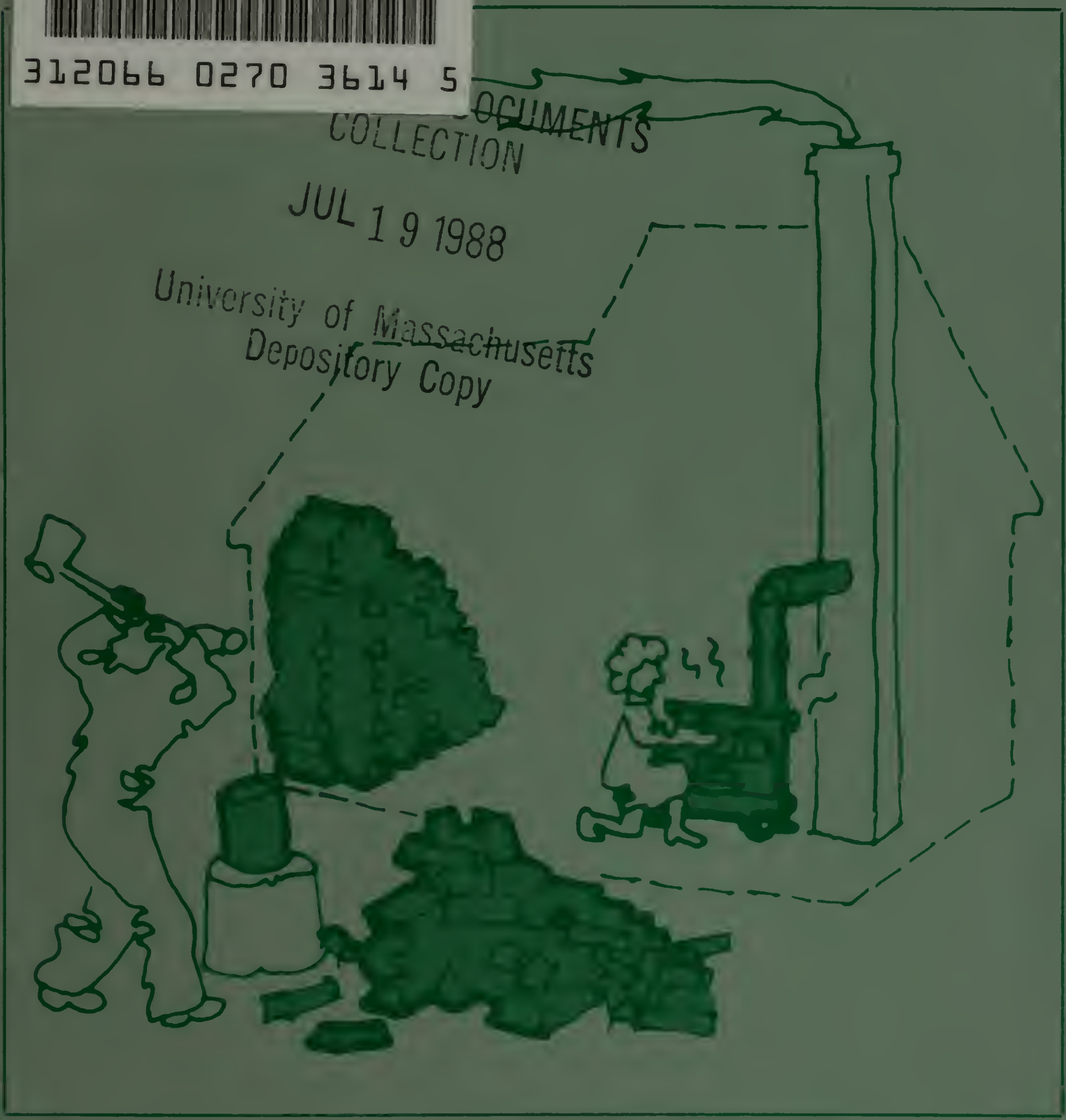
Home Heating With Wood and Coal



ENVIRONMENTAL SCIENCE DEPARTMENT
MASSACHUSETTS AUDUBON SOCIETY

Compliments of Executive Office of Energy Resources

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How This Booklet Can Help You

If you are thinking of buying a wood or coal stove, or already own one, this booklet will help you to:

- Decide if wood or coal heat makes sense for you
- Determine whether you can save money with wood or coal heat
- Decide which is better for you — wood or coal
- Choose, install, use and maintain a stove
- Move heat from your stove into nearby rooms
- Improve an existing stove

This booklet focuses on wood and coal stoves, although specific sections also discuss fireplaces and central heating systems. Recent research findings dealing with safety, pollution, and increasing stove efficiency are incorporated throughout.

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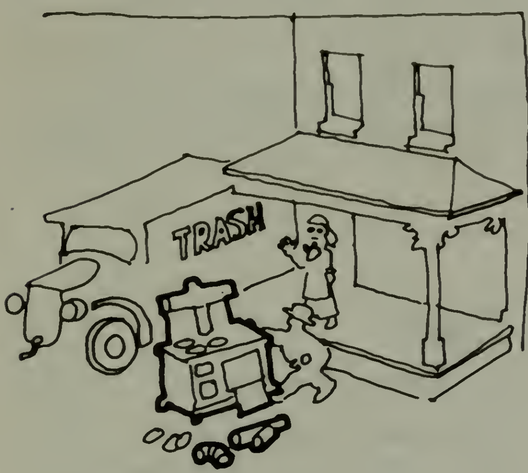
WOOD OR COAL HEAT – IS IT FOR YOU?



1920's: Old Stove Out

1980's: New Stove In

Throughout most of American history, wood and coal have been the primary fuels used for home heating. Between 1920 and 1960 most homeowners switched away from wood and coal to "clean and modern" fuels such as oil, gas, and electricity. In the 1970's and 1980's, as oil, gas, and electricity prices skyrocketed, more and more homeowners returned to wood or coal, using them as either a primary or supplemental heat source. Today, despite declining energy prices, wood and coal heaters continue to offer many attractions.

Advantages of Wood and Coal

Wood and coal, often called *solid fuels*, offer several advantages over other fuels:

- Wood and coal, in many cases, can cut home heating costs substantially.
- Wood and coal fires provide warmth, cheer and a sense of well-being that many people find almost magical. There are probably few things more comforting than sitting by a fire on a cold winter's night and watching the flames dance about while listening to the snap and crackle of the fire.
- A wood or coal stove can provide additional heat to cold rooms in your home, making these areas more comfortable.

- When building an addition onto a house, it is often less expensive to install a wood or coal stove to serve the new space than to extend or install a conventional heating system.
- A wood or coal stove or fireplace can be an attractive addition to your home's decor. Today's heaters are not just plain black boxes. Decorative heaters with enamel or tile sides, glass doors, and brass-plated handles are now readily available from many manufacturers.
- Many people like the exercise and feeling of accomplishment that comes from cutting, splitting, and stacking wood, and from building and stoking a wood or coal fire.

Problems with Wood and Coal

There is a lot more to heating with wood or coal than may first meet the eye:

- Heating with wood or coal involves considerable time and effort and probably some changes in life-style as well. If you are not prepared to tend a fire regularly and maintain a stove properly, then wood or coal heat is probably not for you.
- Both a stove and a wood pile or coal bin take up space around your home that could be used in other ways.
- Moving fuel and ashes through your home can leave a lot of dirt and dust lying around.
- Wood and coal combustion add pollutants to the air that can be harmful to human health and to the health of the environment.
- If members of your household have health problems such as asthma or a bad back, these problems can be aggravated by cutting, carrying and burning solid fuels.
- Poor wood-cutting practices can deplete forest soils of important nutrients, cause excessive erosion, and adversely affect water supplies.
- Wood and coal stoves can be more dangerous than other heating systems; improperly installed and maintained stoves are one of the leading causes of house fires.
- If you don't use your wood or coal heater frequently, or if you do not have an economical source of wood or coal, then using a solid fuel heater may not save you any money. There are many costs associated with wood or coal heat. These costs can equal or exceed the value of any fuel savings, as is humorously illustrated by the analysis on the next page.

Costs and Savings With Wood Heat
One Person's Experience

Item	Cost	Savings
(2) Stoves, equipped and set up	$1,385.	—
Pursue reputable wood dealer (not available)	76.	—
Buy: Chainsaw	210.	—
Axe, hatchet, wedges, maul, cant hook	119.	—
Old truck (scrapped after first load)	595.	—
New 4-wheel drive truck	8,645.	—
Wheel chains	88.	—
Replace truck rear window (twice)	310.	—
Work gloves (swiped from shop)	—	—
Fine for cutting wrong trees	500.	—
Buy: 5-acre wood lot	4,995.	—
Splitting machine	950.	—
14 cases beer	126.	—
6 fifths brandy	38.	—
Fine for littering	250.	
Towing charge (creekbed to hardtop road)	50.	
Gas, oil, chain sharpening, and Band-Aids	97.	
Doctor's fee for splinter removal from eye	45.	—
Safety glasses (swiped from shop)	—	—
Medical costs for broken toe (dropped log)	$128.	—
Safety Shoes	35.	—
Repair burned hole in Living Room carpet (unsuccessful)	76.	—
New Living Room carpet	699.	—
Paint Living Room walls & ceiling	110.	—
Taxes on wood lot	44.	—
Wood lot boundary dispute settlement	465.	—
Roof repair after chimney fire	840.	—
Fine for assaulting fireman	50.	—
Extension ladder	55.	—
Chimney brush	22.	—
Medical cost for broken leg (fell off roof)	478.	—
Chimney cleaner service	90.	—
Coffee table replacement (Chopped up and burned while too drunk to bring up firewood from cellar)	79.	—
Divorce settlement	14,500.	—
Annual Fuel Oil Saving	—	376
Total	**$36,150**	**$376**

Costs and Savings

Too many people have made the mistake of buying a cheap stove, throwing it together in the living room, tossing wood into it occasionally and using it haphazardly, and then they wonder why the fuel bills don't go down. A solid fuel heater (including installation) typically costs $1000 and annual maintenance costs typically add up to $75. To pay these costs, you will need to save approximately $175 on fuel costs, *just to break even*. If you buy an expensive heater or need a new chimney, the breakeven point is likely to be even higher.

While energy prices vary from region to region and from year to year, if you presently heat your home with **electricity**, you will probably save money with wood or coal heat as long as: (1) you use your wood or coal heater at least a quarter of the time during the winter; (2) you buy wood or coal in bulk and not by the bundle; and (3) your heater isn't an inefficient fireplace.

If you presently heat your home with **oil or gas,** Table I will help you figure out whether wood or coal heat can save you money. In Table I, for each numbered line, circle the statement that best describes your situation. The notes at the bottom of the table may help you to figure out which

statement to circle. At the top of each column is a point score. For each statement you circle, write down the point score. Finally, total all seven of your point scores; if your score equals 1 or more, then wood or coal heat can probably save you money. If your score equals 0, you will break even, and if your score is less than 0, wood or coal heat will probably cost you more than you will save.

Table I
If I Presently Heat with Oil or Gas Will Wood or Coal Heat Save Me Money?

	Point Scores				
	–2	–1	0	+1	+2
1. Cost of Your Present Heating Fuel*					
Oil ($/gallon)	$.70	$.85	$1.00	$1.15	$1.30
Gas ($/therm)	$.50	$.61	$ .70	$ .82	$ .94
2. Condition of your present heating system		New, efficient	Average	Old, worn-out	
3. Solid Fuel Cost**					
Wood ($/cord)	$150	$130	$110	$90	$70
Coal ($/ton)	$115	$100	$ 85	$70	$55
4. Proportion of time you will use your wood or coal heater***		Some-times	Fre-quently	All of the time	
5. Cost of Solid Fuel System, including installation ($)	$2200	$1600	$1000	$400	$0
6. Efficiency of Solid Fuel System (%)****	34%	42%	50%	61%	79%
7. Will you lower the temperature in rooms not heated by your solid fuel heater? By how many degrees?					
If your present heating bill is $900/yr	0°	5°	10°	15°	20°
If your present heating bill is $1800/yr	0°	2.5°	5°	7.5°	10°

* Your local utility and oil dealer can tell you the price of oil and gas in your local area.

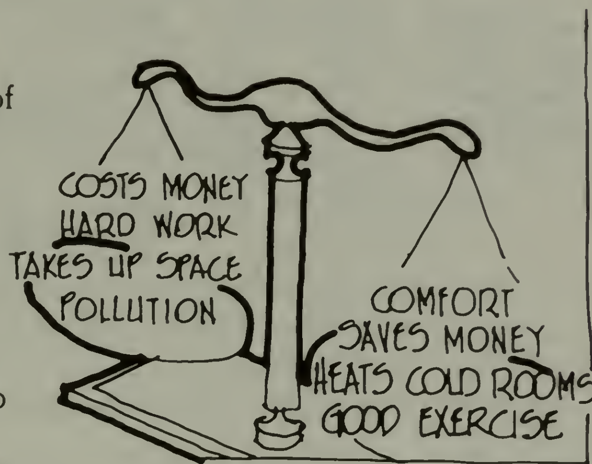
** This chart assumes that only hardwood or anthracite coal is purchased. Call several wood and coal dealers to get the price in your area. If you cut your own wood, $50/cord is a typical price for tools and fuel.

*** Weekend and evening use equals "sometimes." If you use your wood or coal heater less often, it is unlikely your fuel savings will justify the cost of the heater.

**** To estimate the efficiency of a solid fuel system see "Burning Basics" on p.7, or ask your stove dealer for the **overall efficiency** rating of the stove you own or are considering.

If it seems that wood or coal heat will save you little or nothing, you should consider instead other home energy improvements such as insulation, weatherization, and improving your present heating system. Often these measures will save you more money than a wood or coal heater. For more information on these topics, see the other booklets in Mass. Audubon's Energy Saver's series (listed in the back of this booklet).

Making a Decision



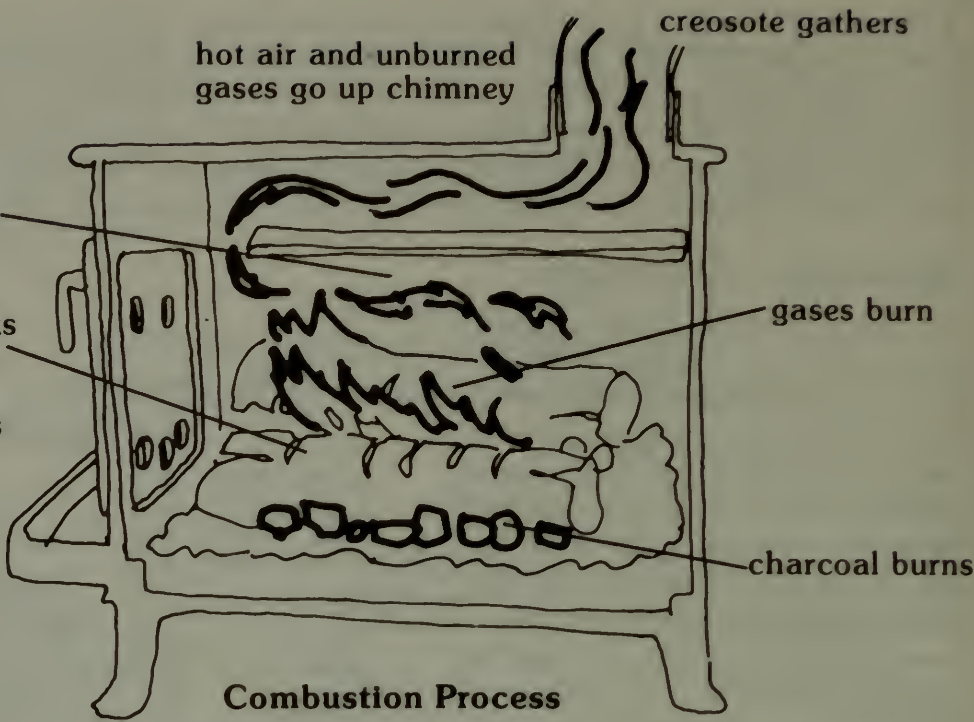
To decide whether wood or coal heat is for you, carefully consider how the advantages and problems of wood and coal heat apply to your particular situation. A few minutes considering the pros and cons can save many problems later on. Ask yourself a few questions: Will the time and attention required by a wood or coal stove fit into my lifestyle? In particular, am I prepared to make the commitment to properly maintain a stove? While an unused stove will not save you money, an improperly maintained stove can be a serious hazard. Do I have space for a stove and fuel storage? Do I mind a little dirt and dust in my house? Does anyone in my house have health problems which wood or coal heat could aggravate? Is saving money or the lure of a warm, crackling fire my primary reason for considering wood or coal heat? If saving money is an important consideration, you will want to carefully compare the cost of a wood or coal heating system to the savings you can expect. As you answer these questions, it should become clear whether wood or coal heat makes sense for you.

If you decide that wood or coal heat does make sense for you, the rest of this booklet will help you understand, select, install, use, and maintain a wood or coal heater.

BURNING BASICS – COMBUSTION AND EFFICIENCY

In order to choose and use a wood or coal heater intelligently, it is important to understand how they work.

A wood or coal heater does three things: burns the fuel, vents the exhaust, and transfers the heat to the living space. Some heater designs do these tasks more efficiently and completely than other designs, allowing



Combustion Process

less of the energy from the fuel to escape up the chimney. To understand the significance of different design features, it's important to know the basics about combustion.

Combustion is the process that rapidly turns the chemical energy stored in wood or coal into light and heat. This process can be broken down into four stages. First, any moisture present in the fuel is driven off (the wetter the fuel, the more energy that is wasted in this process). Second, a reaction occurs at high temperatures that breaks the fuel into solids (charcoal) and gases. Third, if oxygen is present, the charcoal burns — a process known as *primary combustion*. If little oxygen is present, the fire will be "starved for air" and will slowly smolder or go out. Finally, at still higher temperatures, the gases burn — a process known as *secondary combustion*. If temperatures are too low, or the oxygen supply too limited, then secondary combustion will not take place and unburned gases will go up the chimney.

When unburned gases leave the hot firebox and reach the relatively cool chimney, they condense and produce *creosote*, a black, tarry material that can build-up inside your chimney. Creosote can restrict airflow in the chimney, and it can also catch fire, causing a potentially dangerous chimney fire.

The unburned gases released by wood and coal combustion can also be harmful to human health and to the health of the environment. Many of the compounds in wood and coal smoke are similar to those found in cigarette smoke. In high concentrations these compounds can contribute to lung and heart disease. These problems are serious enough that the U.S. Environmental Protection Agency has announced that it may soon restrict new stove sales to only low-polluting models.

The *overall efficiency* of a heating system is the measure of how well the system burns fuel to generate heat, and how well it transfers this heat into your house.* Due to inefficiencies, only some of the fuel you buy ends up providing heat for your home. The rest of the heat produced by burning oil, gas, wood, or coal goes up the chimney as unburned gases or as heated air. Heating systems vary widely in efficiency. A fireplace typically has an overall efficiency of 10%; 90% of the energy in the wood goes up the chimney. A high-efficiency wood stove can have an overall efficiency of 75%; only 25% of the energy in the wood is wasted. (No heating system is 100% efficient; some energy is always wasted.) Just as a high-efficiency car travels more miles on a gallon of gasoline, a high-efficiency wood or coal heater provides more heat per cord of wood or ton of coal. With a high-efficiency heater, you can get more heat for your heating dollar.

In a coal heater, the solids and gases burn at approximately the same temperature (around 1000°F) and, to a large extent, primary and secondary combustion take place at the same time. As long as there is sufficient oxygen, relatively complete combustion will occur. The efficiency of most coal stoves is generally 50-60%.

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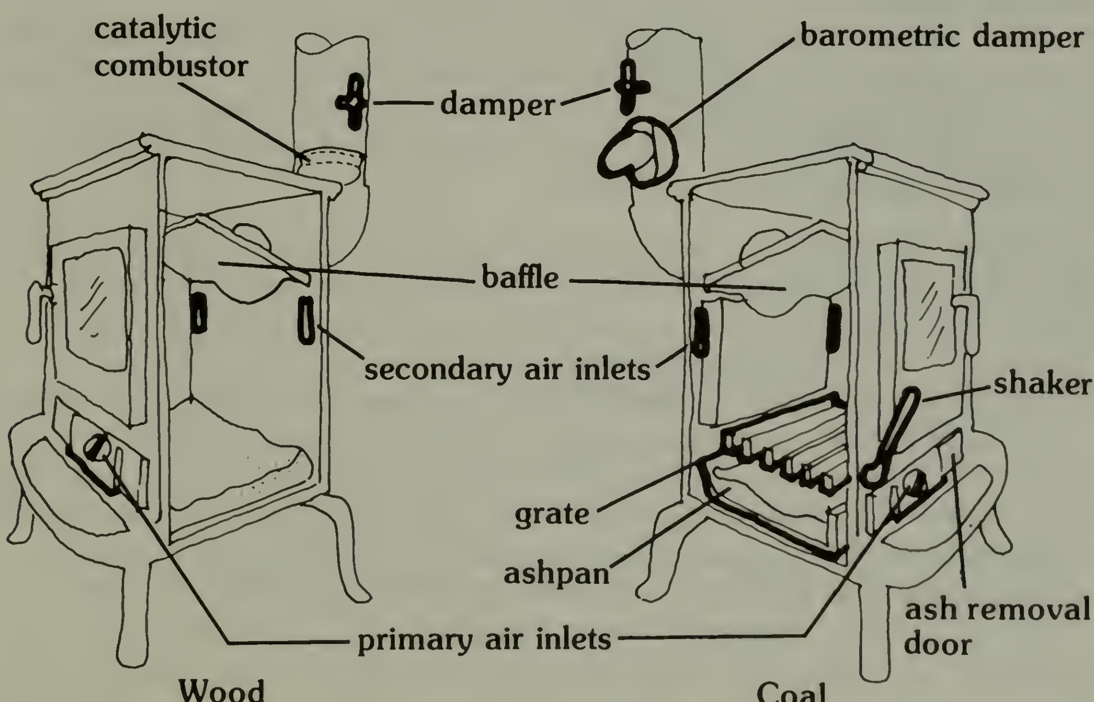
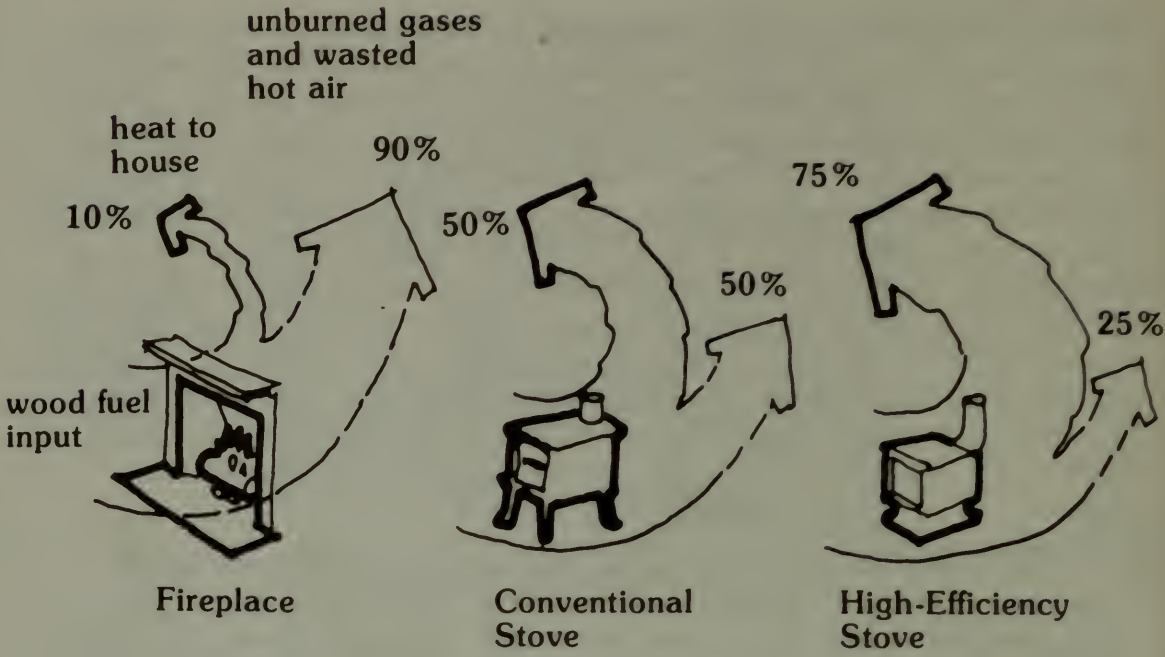
* *In addition to "overall efficiency", wood and coal heating literature may also refer to "combustion efficiency" and "transfer efficiency."* ***Combustion efficiency*** *is the measure of how well a system burns fuel to generate heat.* ***Transfer efficiency*** *is the measure of how well a system transfers heat into your house. Overall efficiency is a combination of combustion and transfer efficiency. The overall efficiency of a heating system will always be lower than either the combustion or transfer efficiency. For example, a typical airtight wood stove has a combustion efficiency of 70%, but an overall efficiency of only 50%.*



Features of Wood and Coal Stoves



Comparative Efficiencies of Solid Fuel Heaters

In a wood heater, the solids burn at approximately 500°F, but gases need temperatures over 1000°F to combust. Consequently, to achieve high efficiencies, gases must remain in the heater at a high temperature, with sufficient oxygen, so the gases will burn, and the heat generated must be transferred into the house instead of up the chimney. To maintain a hot firebox temperature, many heaters contain heavy heat-absorbing materials such as cast iron, soapstone, or firebrick. To insure adequate oxygen, many heaters contain *secondary air inlets,* which feed oxygen into the firebox at the point where hot gases gather. To help reduce the amount of heat that goes up the chimney, many heaters contain *baffles* — metal or firebrick dividers that force the exhaust gases through a circuitous exit route, providing more time for the gases to combust and release their heat before leaving the stove. Wood stoves without all of these features typically have efficiencies of 35-50%. Stoves with all of these features generally have efficiencies of 50-65%.

Another approach to increasing secondary combustion in wood stoves is to use a catalytic combustor. Catalytic combustors contain metal catalysts (made from either platinum or palladium) that interact with unburned gases on a molecular level, lowering the temperature at which they will burn from over 1000° F to under 500° F. A high percentage of the otherwise escaping gases undergo combustion, yielding more heat, less creosote and fewer pollutants. Catalytic combustors are a standard feature on some new stoves, or catalysts can be retrofitted onto most existing stoves. A new catalytic stove often has an efficiency of 60-75%. Retrofit catalysts generally increase the efficiency of an existing stove by 5-15%.

FIREPLACES, STOVES, FURNACES AND BOILERS

Fireplaces

Fireplaces are, at best, very inefficient heaters. The draft created by the fire draws room air up the chimney along with smoke, sometimes resulting in a net heat loss from your fireplace instead of a heat gain. Still more heat is lost if the damper is left open after the fire dies out. Fireplaces are very pretty, but as heaters they rate a grade of "D minus."

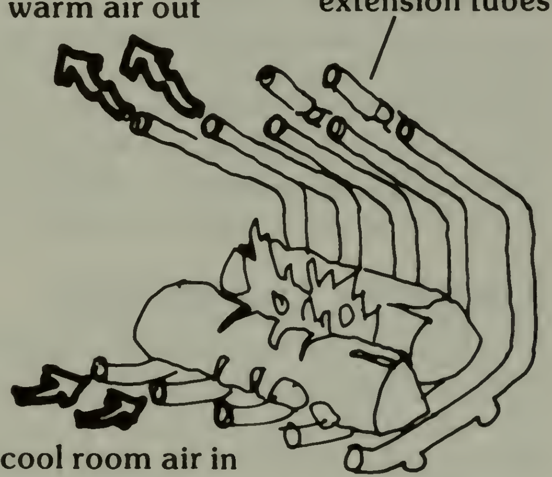
Some new masonry and prefabricated fireplaces contain special heat-storing and heat-circulating features, resulting in efficiencies of 20-40%. If you like the atmosphere of an open fire, you may want to consider these units. However, the efficiency of these fireplaces is significantly lower than the 50-75% efficiency of today's stoves. If you want to save money, consider a stove instead.

Upgrading an Existing Fireplace

Probably the best way to upgrade a fireplace is to replace it with a wood stove. Stove models specially designed to fit into a fireplace opening are available, or a freestanding stove can be placed on the fireplace hearth with a stovepipe connected to the fireplace chimney.

However, if you don't want to purchase a stove, there are some things you can do to make your fireplace more efficient. While none of these upgrades will make your fireplace as efficient as a stove, they can improve the performance of your fireplace substantially.

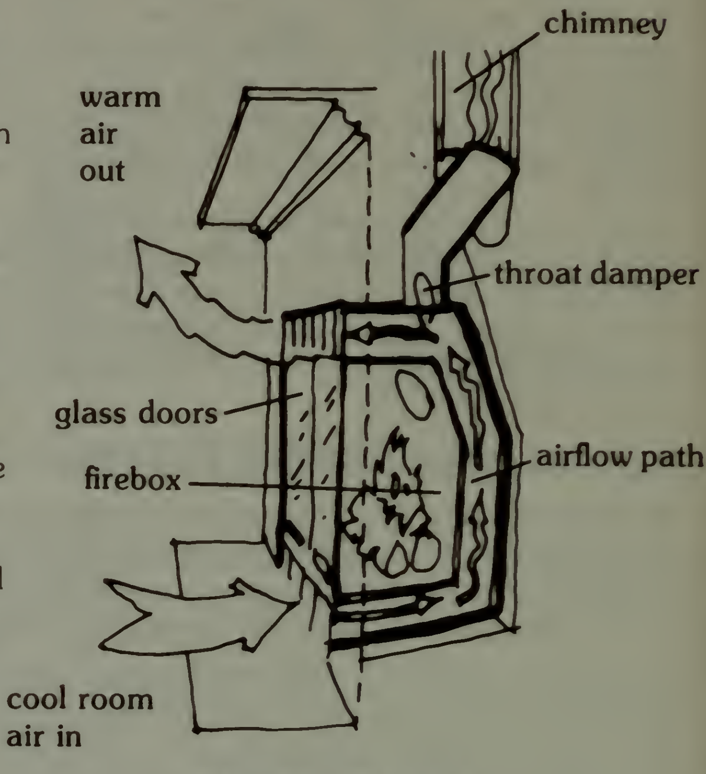
Grates: Tubular grates, which contain several hollow tubes that wrap around the fireplace (see drawing), are designed to extract additional heat from the fireplace by shooting warm, fire-heated air into a room. Room air enters at the bottom of each tube, is heated by the fire, and emerges from the top end where it re-enters the room. Blowers are sometimes used to increase air circulation through the tubes. Extension tubes, which attach to the top of the grate, are available for some models to help insure that the heated air does not get swept back into the fireplace. Generally, grates with blowers or extenders raise fireplace efficiency to about 20%, providing additional heat and fuel savings. Grates without blowers and extension tubes, and so called "radiation enhancing" grates, generally have little impact on fireplace heat output.



Tubular Grate

Glass Doors: Glass doors reduce the amount of warm air from your house that gets drawn up the chimney. When the fire is burning briskly, the doors should be left open to let heat from the fire radiate into the house. When the fire is burning low, the doors should be closed. The energy saved by glass doors often does not justify their cost. However, don't confuse simple glass doors with the fireplace inserts discussed below.

Fireplace Inserts: Fireplace inserts contain two shells: an inner shell that contains the fire in a sealed firebox, and an outer shell in which air circulates. Cool room air is drawn in along the bottom of the outer shell, is heated as it passes along the hot firebox, and is shot into the room at the top of the outer shell (see drawing). Inserts improve fireplace performance because air circulation is a very good way to transfer heat into a room, and because the sealed firebox limits the amount of room air that is drawn up the chimney. While inserts vary widely in quality and effectiveness, a good insert will generally raise fireplace efficiency to 30% or more, a substantial improvement over a normal open fireplace. Good inserts should have a relatively airtight firebox (the glass doors in front close tightly); a tight throat damper (see drawing), which closes in stages and allows little air to escape when the damper is fully closed; and good airflow in the outer shell (accomplished with either a blower or with natural air movement in large open passageways).



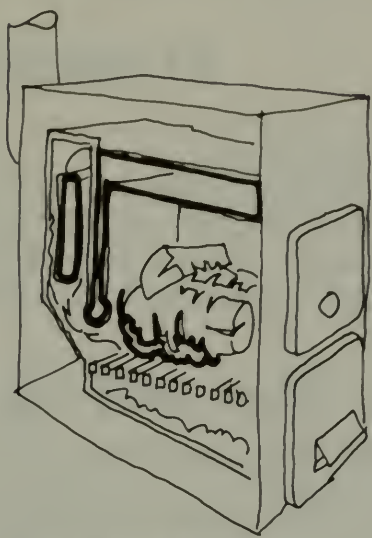
Fireplace Insert

Furnaces and Boilers

Furnaces and boilers are central heating systems that heat a whole house from a central location (usually the basement). A furnace produces hot air which is distributed through ducts to registers in each room of a house. A boiler produces hot water which is distributed through pipes to radiators or baseboard heaters scattered throughout a house. Furnaces and boilers that burn oil, gas, wood, and/or coal are available.

Central heaters can heat a whole house to a relatively uniform and steady temperature. Stoves are well-suited to heat a few rooms but are generally not suited to heat an entire house. Several stoves can heat a whole house, but not as uniformly nor as easily as a central heater.

Generally, solid fuel furnaces and boilers are used in place of a conventional oil, gas, or electric heating system. For this reason, solid fuel furnaces and boilers should be compared with conventional heating systems as well as with other types of solid fuel heating systems. Many solid fuel central heaters can burn either wood or coal. Some even have automatic fuel loaders or auxiliary oil or gas burners to provide heat when no one is home to stoke the fire.



Wood Boiler

A solid fuel central heater takes longer to heat up or cool down than a solid fuel stove or an oil or gas central heating system. Operation of solid fuel central heaters is more demanding than for an oil or gas central heating system. With a solid fuel central heater, fuel must be cut or purchased, the fire must be fed, the ash box emptied, and components cleaned frequently to remove creosote deposits.

Generally, a wood or coal central heater is appropriate if you have an inexpensive source of wood or coal, and if you are willing to spend the time and energy needed to keep the system operating properly. Otherwise, a conventional heating system, perhaps together with a wood or coal stove, makes more sense.

Stoves

Stoves are *space heaters;* they principally radiate heat to people and objects in the immediate vicinity. Stoves are well-suited to heating a few frequently-used rooms in a house; if cooler temperatures are maintained in unused portions of the house, considerable fuel and money can be saved. Stoves are also well-suited for providing heat in new additions and in existing rooms that do not receive adequate heat. It is often cheaper to install a stove in a room than to extend a central heating system to serve that room.

Stoves are not suited to heat a whole house (with the possible exception of a small, 1-3 room house). Although heat can flow from a stove to adjoining rooms, when you attempt to provide heat throughout an entire house using a single stove, you will usually find that the room containing the stove is too hot and peripheral rooms are too cold.

For most homeowners, stoves are the solid fuel system of choice. In general, stoves burn wood and coal more efficiently and are less expensive to install than fireplaces, furnaces, and boilers. If you are looking for a system to heat a few heavily-used rooms, or to heat a previously unheated or underheated room, you should seriously consider a wood or coal stove.

PLANNING FOR A STOVE

This section discusses many of the decisions you need to make to focus your stove-shopping on the models most appropriate for your needs. If you think about these issues before you go to a stove dealer, shopping will be quicker, easier, and more likely to result in the optimal stove for your needs.

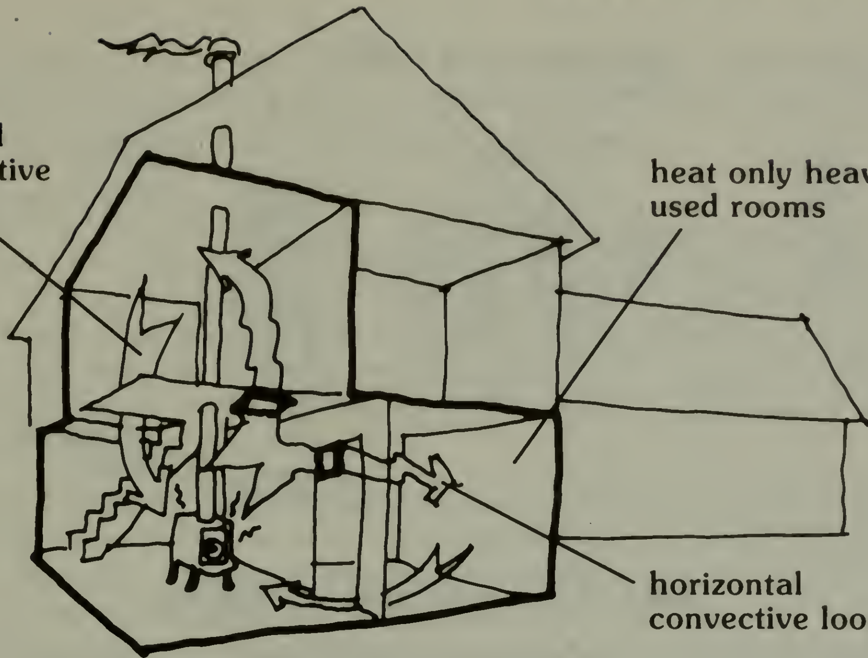
How Often Will You Use Your Stove?

Thinking about how often you are likely to use your stove can make your stove selection process simpler. For example, if you're going to use your stove for only a few special occasions each year, then it generally doesn't make sense to pay a lot extra for fuel-conserving special features. Likewise, if you plan to use your stove as a primary source of heat and need to keep it burning continuously throughout the winter, then you'll probably want features that will enable long and efficient burns. In between these two extremes, you might want to use your stove regularly in the evenings and on weekends. When thinking about this issue, consider the following questions: When will people be using the rooms heated by the wood stove? How likely is it that these people will have the time and inclination to build and tend a fire? Is comfortable back-up heat available or must the stove be used to ensure comfort? Many people buy a stove unsuited to their needs because they do not estimate, or unrealistically estimate, how often the stove will be used.

How Much of Your Home Should Your Stove Heat?

To decide which rooms you need to heat, consider how often you use each room during the winter. Rooms that are used and heated many hours each day (such as a family room or living room) are prime candidates for heating with a wood or coal stove. Rooms that are only used for a few hours (such as a laundry room, for example), or rooms that don't need to be fully-heated (bedrooms possibly), are generally less-suited for heating with a wood or coal stove. By heating only heavily-used rooms, you can provide comfort in those areas that are most used while lowering the thermostat so less heat is used in peripheral areas. Generally, the fewer rooms you heat with a stove, the less work you will have to do tending your stove, and the more money you will save (assuming you set back the thermostat in rooms not served by the stove).

If you are building an addition onto your house, while a solid fuel stove can serve as the primary heating system for the new space, it should not be the only heat source for spaces that can be damaged by freezing temperatures. For example, if you put a bathroom in the addition it should have an automatic source of heat, such as an auxiliary electric heater, to keep pipes from freezing while you are away.



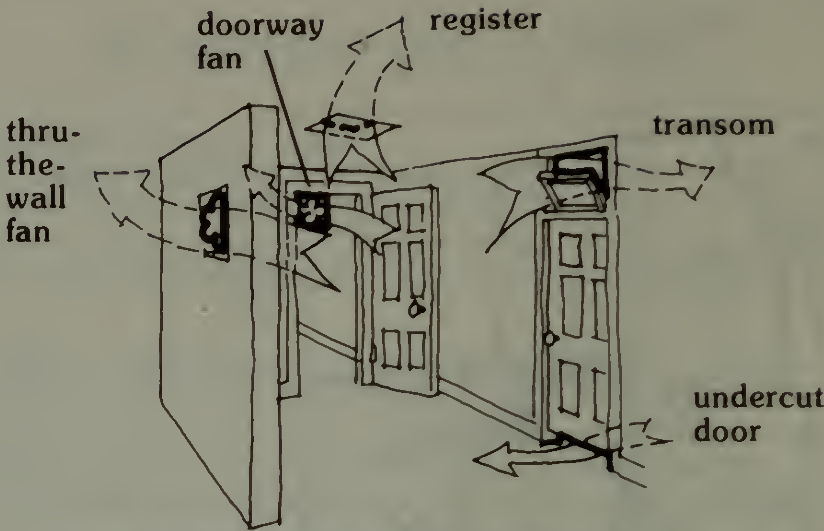
Selecting Rooms to Heat and Moving Heat

The location of existing chimneys or pathways for a new chimney will also affect your decision on which rooms to heat — see the section on "Chimneys", page 16, for details.

Moving Heat

Where you place your stove and what size stove you choose will depend in part on how well the heat generated by the stove will move through your house. To understand how heat moves in your house, it is important to keep in mind two rules. First: *hot air rises and cool air falls.* Hot air is lighter than cool air, so warm air floats over cooler air, as demonstrated by the fact that most rooms are cooler near the floor than near the ceiling. Many people interpret this rule to mean: "If I put a heater downstairs, the heat will rise naturally and take care of the upstairs too." Right? Not necessarily! The other adage one needs to keep in mind is *what goes up must come down.* In order for hot air to rise it must be able to displace the cooler air that is already occupying the space above. If the hot air can't move up because it can't get into the space above, it simply backs-up.

A common example of this problem is a house with a single stairway and a stove downstairs. The owners wonder why the upstairs is never very warm while downstairs it is roasting. This problem occurs because there is no pathway for the cool air occupying the upstairs space to return downstairs. If a *register* (a grate which lets air pass through) is put in the floor of the upstairs hall, the effect will be like unplugging a full bathtub of water: the cool air will fall through the register to the downstairs, allowing the warm air to rise up the stairs and flood the upstairs with heat. This cycle of hot air rising and cool air falling is known as a *convective loop.* Once started, it will continue to operate as long as there is a temperature difference between upstairs and down.



Ways to Improve Heat Circulation

To a lesser degree, this convective loop will operate horizontally on one floor. Again the key requirement is the movement of air in a complete circle. Keeping a door open between two rooms will allow hot air to rise through the top of the doorway while cool air falls through the bottom of the doorway (see drawing). You can install a *transom* over a door while *undercutting* the door (shortening the door slightly so there is a little space between the bottom of the door and the floor). Hot air rises through the transom and cool air slips through the small opening under the door (see drawing). These methods help move heat to adjoining rooms.

Another technique for moving heat horizontally between rooms is to use fans to push warm air from one room to another. Small fans can be placed in the corners of doorways, or special through-the-wall vent fans can be installed (see drawing).

Floor registers, open doorways, transoms, undercut doors, doorway fans, and through-the-wall fans are all useful devices for moving heat to adjoining rooms, but these techniques are generally not useful for moving heat to distant rooms. If you want to move heat from a wood or coal stove to a remote area of your house, you will probably need to install ducts and a blower (much like a central warm-air heating system), or you should consider installing a second stove in the remote area you want heated.

Example: Mr. and Mrs. Jones have a wood stove in their living room. They wish to move heat from this stove to the adjoining dining room, their bedroom upstairs, and to a family room down a long hall. After some thought and planning, they decide to make the following changes:

1. They install a small fan in the doorway between the dining and living rooms to help pull warm air into the dining room. Cool air returns through the bottom of the doorway.
2. They install a floor register in their bedroom floor and undercut their bedroom door. Warm air rises through the floor register into their bedroom. Cool air slips under their bedroom door and down the staircase back to the living room.

3. They install a second wood stove in the family room. The family room is too far away from the living room for heat to move between the two without an extensive and expensive duct system.

Chimneys

Chimneys vent smoke and other combustion products outside. It is essential that your chimney do its job effectively and safely; if your chimney is not up to the task, you risk venting noxious pollutants inside your house, or you can burn down your house. If you are installing a new stove, you have two major chimney options: (1) use an existing chimney, or (2) install a new chimney.

Existing Chimneys: Existing chimneys can only be used if they are in good shape and if they serve no other appliances. It is vitally important that you connect your wood or coal stove to its own flue. The general rule is one appliance per flue. If you connect a wood or coal stove to the same flue as a furnace, boiler, or water heater, drafts may develop that can cause lethal fumes from one appliance to exit into your house through the other appliance.

If you are considering using an existing chimney you should inspect it thoroughly, inside and out, for cracks and other defects. First, have the chimney cleaned — defects can't be spotted if the chimney is dirty. A trained chimney sweep can do the cleaning for you and can give you an expert evaluation of the chimney's condition. In evaluating a chimney, look for cracks and loose mortar — any defects that are found can generally be repaired by a mason. A mason should also brick-in and mortar old stove connections and other openings in your chimney. The flat, metal covers often used to seal openings are not very safe; a pressure surge in the chimney can blow them out of place. Also, these covers leak air, which reduces the draft up your chimney.

When inspecting your chimney, you should also look up the inside of the chimney with a flashlight and a mirror to check the chimney *liner.* A liner is either a masonry casing or stainless steel tube that is housed within the bricks of the chimney. Its function is to contain exhaust gases, withstand high temperatures, and resist corrosion from wood and coal smoke. The liner should appear smooth and intact; if it is cracked or damaged, it will have to be replaced. If you see only bricks, then you have an unlined chimney. If your chimney was built before 1920 it is probably not lined. If your chimney is unlined you must have it lined before you hook-up a wood or coal stove to it — an unlined chimney can be a fire and safety hazard.

The most common way to line an existing chimney is to install a stainless steel liner. A liner is usually installed from the roof by lowering it down the chimney in sections. Any chimney that is not straight can be difficult to line, but elbows and flexible stainless steel liners are available. Ordinary steel stovepipe is not an acceptable liner because wood or coal smoke will corrode it quickly. Coal smoke is more corrosive than wood smoke; coal stoves require special stainless steel liners rated for "all fuels."

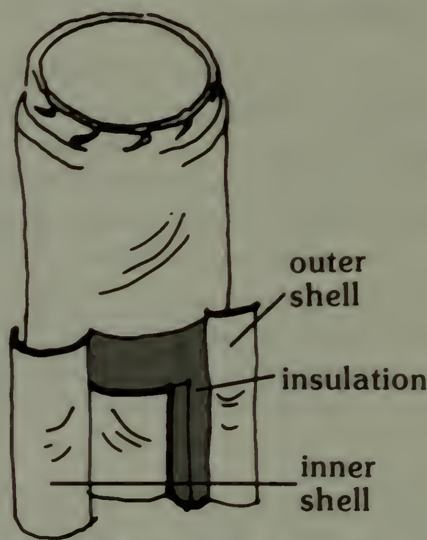
Another relining method involves lowering an inflatable tube into the chimney. The tube is inflated and a cement-like mixture is pumped between the tube and the chimney walls. After the material hardens, the tube is deflated and removed, leaving an insulated liner bonded to the chimney walls. This system is generally more expensive than a stainless steel liner but is often more suitable for chimneys that are not straight.

Most people hire a professional contractor, such as a chimney sweep, to line their chimney. If you want to line your own chimney, some of the publications listed in the "For More Information" section will tell you how.

If your existing chimney is in poor shape, if it has no unused flues, if it is unlined and can't be easily lined, or if there is no chimney where you want to put your stove, then you will need a new chimney.

New Chimneys: The most common type of new chimney is an *insulated prefabricated metal chimney*. These chimneys generally cost between $350 and $750 installed. While a new masonry chimney is also an option, a masonry chimney costs over twice as much as a prefabricated metal chimney.

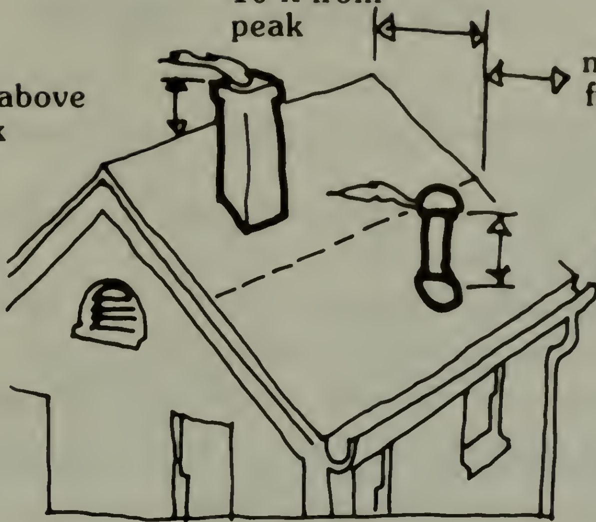
An insulated chimney generally consists of an inner and outer stainless steel tube with insulation in between. The inner tube is made from special alloys that resist corrosion. The insulation helps to keep the inner surface warm, limiting creosote buildup. Insulation also reduces the temperature of the outside surface of the chimney; a cooler outer surface temperature means that a chimney can be placed relatively close to combustible materials such as wood. The installation instructions that come with the chimney will tell you exactly how much room you need to leave. If you don't follow the installation instructions and clearances exactly, you risk setting your house on fire.



Prefabricated Chimney

To get a good draft, any chimney should extend at least 2 feet above the roof of a house. If the chimney is within 10 feet of the peak of the roof, it should extend at least 2 feet above the peak (see drawing). With a flat roof, the chimney should extend at least 3 feet above the roof.

An uninsulated stovepipe should never be used as a chimney. It will quickly corrode, and its outer surface will get very hot. An uninsulated stovepipe cannot be placed within 18 inches of any combustible material. If you were to use an uninsulated stovepipe for a chimney, you would have to cut a hole nearly 4 feet wide through your roof!



Proper Chimney Height

Many good brands of insulated chimneys are available. You should look for a chimney that meets Underwriters Laboratories standard UL 103-HT. The HT stands for "high temperature." A high temperature chimney (one that is rated to withstand a temperature of 2100° F) will help protect your house from chimney fires. If you are planning to install a coal stove, buy a chimney rated for "All Fuels." Coal smoke is very corrosive; an "All Fuels" chimney is designed to resist this corrosion.

Your options for chimney location are limited by the placement of your stove. Often only one location is possible. However, if you have a choice, it is usually better to install a chimney inside your house than outside. An interior chimney will remain warmer, produce a better draft, and collect less creosote. It can also radiate more heat into the house and it will be protected from the ravages of the weather. On the other hand, interior installations tend to be more complex and require more construction. Outside installations are generally simpler to do, but the chimney will collect more creosote and may not have a strong draft.

Weatherize First

Before you install a wood or coal stove, you should try to weatherize your home. By weatherizing your home, you will reduce your wood or coal consumption and you will make your home more comfortable. In addition, a well-weatherized house can be heated with a smaller stove, saving both space and money. A well-weatherized house should have sufficient insulation in the attic, walls, and in the floor or around the basement or foundation. Windows and doors should be weather-stripped or sealed with rope caulk or plastic. Cracks and holes around the interior of your home — including cracks around windows, doors, electric outlets, and baseboards — should be sealed with caulk, foam, and/or plastic. Don't forget to look for large holes that allow cold air to enter your house through the basement ceiling and attic floor. For more information on weatherization, see Mass. Audubon's WEATHERIZE YOUR HOME OR APARTMENT and ALL ABOUT INSULATION booklets.

CHOOSING A STOVE

If you have read the "Planning for a Stove" section carefully, you should have some ideas about:

- How much of your house you want to heat, and how heat will be moved to each of these areas.
- Where the chimney, and hence the stove, will be located.
- How often you plan to use your stove.

Knowing this information will make it easier for you to select the size stove you need and the features, clearances, and aesthetics that will best fit into your house and living habits. In addition to size, features, clearances, and aesthetics, several other considerations should affect your choice of stove including fuel choice, safety considerations, materials and workmanship, efficiency, ease of operation, manufacturer reliabiilty, and, of course, cost. The best balance among these factors will vary from person to person. The sections that follow will discuss these factors to help you decide which considerations are most important for you.

Read this section carefully, then visit a few stove dealers to see specific stove models and discuss the strengths and weaknesses of each with a salesperson. Most stove dealers are reputable people who know their products. By combining the information in this booklet with the information you get from several different stove dealers, you should have all the facts you need to choose the right stove.

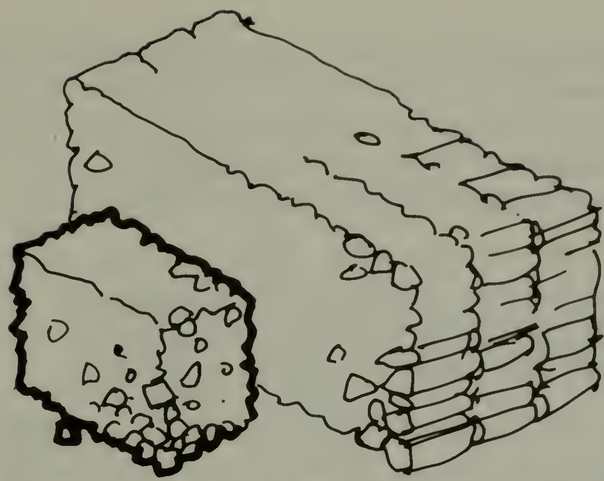
Fuel Choice

Wood: A wood fire has an undeniable charm and provides an ambiance unmatched by other fuels. For this reason alone, many people choose wood heat.

Typically, a wood fire requires a fresh supply of wood every 3-4 hours when it is burning briskly and efficiently. When a slower and therefore longer burn is desired, many stoves can go for 8 hours or more without losing significant efficiency. Most stoves can hold a fire for much longer periods of time if the fire is "starved of air," or "damped down." However, this creates a smoky, inefficient, creosote-generating burn and is not recommended.

Wood fires generate creosote. While stoves vary in the amount of creosote they generate (high-efficiency stoves generally generate less creosote than conventional stoves), all wood stoves generate some creosote. Because of this creosote, wood-stove chimneys need to be cleaned more often than coal-stove chimneys.

Wood is a bulky fuel. Wood is bought by the *cord*, which is a pile of wood that measures 4 feet by 4 feet by 8 feet. The average New England wood



Volumes of Coal and Wood with Equivalent Energy Contents

stove owner burns 3 cords each winter, which is a pile of wood 24 feet long by 4 feet high by 4 feet deep. You would need plenty of yard space to store this amount of wood.

Coal: Coal is a more condensed fuel than wood. Coal is sold by the ton. A ton of coal contains slightly more energy than a cord of wood but takes up a lot less space; 2½ tons of coal (the equivalent of 3 cords of wood) can be stored in a bin measuring 8 feet long by 3 feet high by 4 feet deep, about 25% of the space taken up by the 3 cords of wood.

Coal does not burn as easily as wood. A coal fire takes 3-4 hours to get established because the ignition point of coal is nearly twice the ignition point of wood. To initiate burning, you must start a coal fire with a wood fire first, then add small amounts of coal until the coal bed is established. Since it takes time to get a coal fire burning, coal is not well-suited for getting heat quickly or for providing a short burst of heat for an hour or two, but coal is well-suited for providing steady heat throughout the day.

Once a coal fire gets going, it is easy to tend. A coal fire can easily burn 8 hours without refueling. Coal fires also burn more evenly than wood fires; a coal fire burns at a constant temperature over 1000° F while the temperature and heat output of a wood fire will vary over the course of a burn.

Coal fires produce much more ash than wood fires. This ash must be emptied from your stove daily. While wood ash is an excellent fertilizer, coal ash contains hazardous materials and should not be disposed of near living plants. Some of this ash can gather as dust around your house — a problem that is much more severe than with wood stoves.

Coal contains a significant amount of sulfur. As a result, sulfuric acid, which is highly corrosive to flue linings, forms in coal smoke. If you burn coal and use an insulated metal chimney it is important to make sure your chimney is rated as an "All Fuel" chimney, capable of withstanding the corrosiveness of coal residue.

Wood vs. Coal: Wood is the fuel of choice for people who love the light and enjoyment dancing flames provide. Wood is best for people who will use their stoves for short periods of time, and don't want to spend a lot of time getting a fire started. Wood makes particular sense for people with their own woodlot or other inexpensive wood source.

Coal is the fuel of choice for people who want long and steady burns with a minimum of tending. Coal is for people who want to use their stove extensively, but only have limited storage space. Coal is for people who want to avoid the hazard and hassle of dealing with creosote.

For many people, the choice between wood and coal will depend on economics. Wood and coal economics are affected by the price of the fuel, the heat content of the fuel, and how efficiently the fuel is burned. To compare the cost of wood and coal in your region, see Table II. Often, a cost comparison shows that the cost of wood and coal heat are nearly the same.

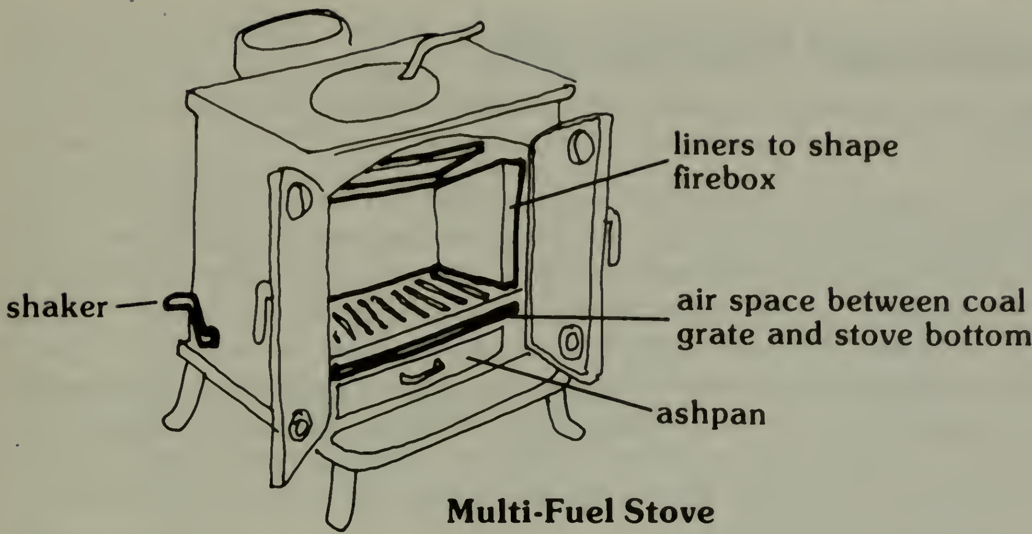
To use Table II, find out the cost of anthracite coal in your region by calling a few local coal dealers. Next, determine the efficiency of the wood stove you own or may purchase. Locate the row and column in Table II that correspond to these figures. The number at the point where this row and column meet is the price of wood that is equivalent to the price of coal in your region. If you can get wood for less than this amount, wood is a better buy. For example, if you are thinking of buying a wood stove with an efficiency of 50%, and if coal in your area costs $140 per ton, then wood is a better buy if you can obtain wood for less than $109 per cord.

Table II
Wood and Coal Cost Comparison

Equivalent Cost for a Cord of Wood
For Different Wood Stove Efficiency Levels

Coal Cost	30% Efficiency	50% Efficiency	70% Efficiency
$ 80 per ton	$ 37	$ 62	$ 87
$100 per ton	47	78	109
$120 per ton	56	94	131
$140 per ton	65	109	153
$160 per ton	75	125	175
$180 per ton	84	140	196
$200 per ton	94	156	218

Note: These figures assume that anthracite coal is burned in a stove with 55% efficiency. Wood figures assume seasoned mixed hardwoods. If seasoned softwood is purchased, multiply the equivalent wood cost figures by 2/3. (For more information on the types of wood, see "Obtaining Fuel," page 37).



Multi-Fuel Stove

Multi-Fuel Stoves: For people who like the advantages of both wood and coal, an increasing number of manufacturers make stoves that can be used with either wood or coal. While coal cannot be burned in a conventional wood stove (coal will not burn without grates that hold the coal, allow ashes to fall through, and let oxygen pass beneath) and wood should not be burned in a conventional coal stove (the wood will burn inefficiently), specially designed *multi-fuel* stoves can be a reasonable alternative to a single-fuel stove. During the 1970's many wood stove manufacturers produced coal grates for their wood stoves as an afterthought to attract more sales. These stoves were poorly-designed for coal burning and therefore performed poorly. In recent years, several manufacturers have designed stoves that are well-suited for burning both wood and coal.

A good multi-fuel stove has several important features including liners to shape the firebox for efficient burning of either fuel; space for air circulation between the coal grate and stove bottom; provision for shaking ashes from a coal fire; and an ashpan for convenient ash removal. While these stoves are generally not as efficient as stoves designed for a single fuel, the efficiency of new multi-fuel stoves has increased substantially since the 1970's.

Safety Considerations

Safety Testing: Building codes and insurance companies generally require that all new stoves be certified to meet safety standards established by Underwriter's Laboratory (UL). To find out if the model you are considering has been tested and certified by UL, look for a UL label on the rear of the stove.

Clearances: Some manufacturers have built heat shields into their stoves before having the stoves tested by UL. Heat shields reduce the acceptable distance between the stove and combustible materials. With reduced clearances, you can better fit stoves into tight spaces, or you can move the stove closer to a wall so it doesn't project as far into your living space. (Clearances are discussed in more detail in the "Installing a Stove" section on page 29.)

Materials and Workmanship

Most stoves are made from three basic materials: steel, cast iron, and/or soapstone.

Steel: Steel stoves are made from heavy plates of steel cut to size and welded together. Generally, the steel should be at least 1/4 inch thick — heat from fires can cause thinner steel sheets to fatigue and burn through in just a few years. In a steel stove, the firebox should be lined with firebricks to protect the stove walls from warping. Steel, because it can be bent and welded, forms stoves with smooth, clean lines, giving plate steel stoves a somewhat sleek and modern look. Because plate steel is welded, it can form an airtight firebox more surely than other materials. One can expect a 15 to 25 year life, before the steel begins to burn through, from a good quality plate steel stove.

Cast Iron: Cast iron is the most time-tested material used in stoves. Many cast iron stoves over 100 years old are still in use. Cast iron stoves are made by pouring molten iron into a mold to form the stove components and then cementing the components together to form a stove. Designs and figures can be carved into the walls of the mold, which can give cast iron stoves a decorative look. Cast iron is very durable and can store a lot of heat in a small amount of space. Like an old cast iron radiator, a cast iron stove absorbs heat and then radiates it evenly over a long period of time. This means that the stove will deliver fairly constant heat for an extended length of time without needing adjustment or refueling.

Soapstone: Soapstone is a beautiful and expensive stove material that is especially good at storing heat. Used in the original pizza ovens, soapstone can absorb great quantities of heat and release this heat very evenly for long periods of time. This means that you will get steady heat from the stove without frequent loading and adjustments. This also means that the firebox maintains very hot temperatures for a long period of time, which

Stove Materials

promotes complete burning of all gases. Soapstone is also prized for the natural design found on each piece of stone — no two stones are exactly alike. On the other hand, soapstone can be scratched if sharp hard edges are scraped over it. Thus, soapstone requires a little more care. Soapstone stoves are often more expensive than other types of stoves.

Workmanship: The material from which a stove is made is not as important as the workmanship and design. A well-made stove will have clean castings, smooth welds, and good workmanship. The doors and air vents should fit tightly, and the hardware and hinges should be solid. If a stove looks loosely or sloppily made, don't buy it. What at first appears to be a great bargain can turn into a first-class headache.

Efficiency

Stove efficiency affects how much fuel you burn and how much creosote and pollutants your stove produces. Stove efficiencies vary from about 35% for a non-"airtight" stove such as a Franklin stove, to 75% for the best catalytic stoves (see "Burning Basics," page 6). The average New England wood stove owner burns 3 cords of wood in a conventional airtight stove with 50% efficiency; if a high-efficiency catalytic stove were used instead, wood consumption would be only 2 cords. On the other hand, if an inefficient non-airtight stove were used, wood consumption would climb to 4¼ cords.

High efficiency can also reduce the production of creosote and air pollutants. Several tests have shown that adding a catalytic combustor to a stove can reduce creosote and major air pollutants by 40-90%! High efficiency stoves without catalytic combustors have been found to reduce creosote and air pollutants by a significant but lesser amount.

To determine the efficiency of particular stoves, ask your stove dealer if any efficiency test results are available for the models you are considering. When comparing efficiency levels between stoves, you should be aware that some testing laboratories report "overall efficiency" levels, and others report "combustion efficiency" levels (see "Burning Basics", page 6). Overall efficiency and combustion efficiency figures cannot be compared directly. All the figures given in this booklet are overall efficiencies.

For a typical stove owner who would burn 3-4 cords of wood in a conventional airtight stove, a high-efficiency, catalytic-equipped stove can save $100-$180 a year in wood and chimney cleaning costs. High efficiency stoves generally cost $100-$300 more, but for frequent stove users, the extra cost is usually paid back in just a year or two. If you expect to use your stove only occasionally (to burn less than a cord of wood a year), the extra cost of a high-efficiency stove may not be worth it. To estimate how much money you can save with a high efficiency stove see Table III.

Table III
Approximate Savings From Using a High-Efficiency Stove

Number of Cords Burned Annually at 50% Overall Efficiency	Savings, in dollars, to go from a stove with an overall efficiency of 50% to a stove with the following overall efficiencies:				
	60%	65%	70%	75%	80%
1	$ 17	$ 23	$ 29	$ 33	$ 37
2	33	46	57	67	75
3	50	69	86	100	112
4	117	142	164	183	200
5	83	115	193	217	237
6	100	138	171	250	275
7	167	212	250	283	312
8	133	235	279	317	350
9	150	258	307	350	387

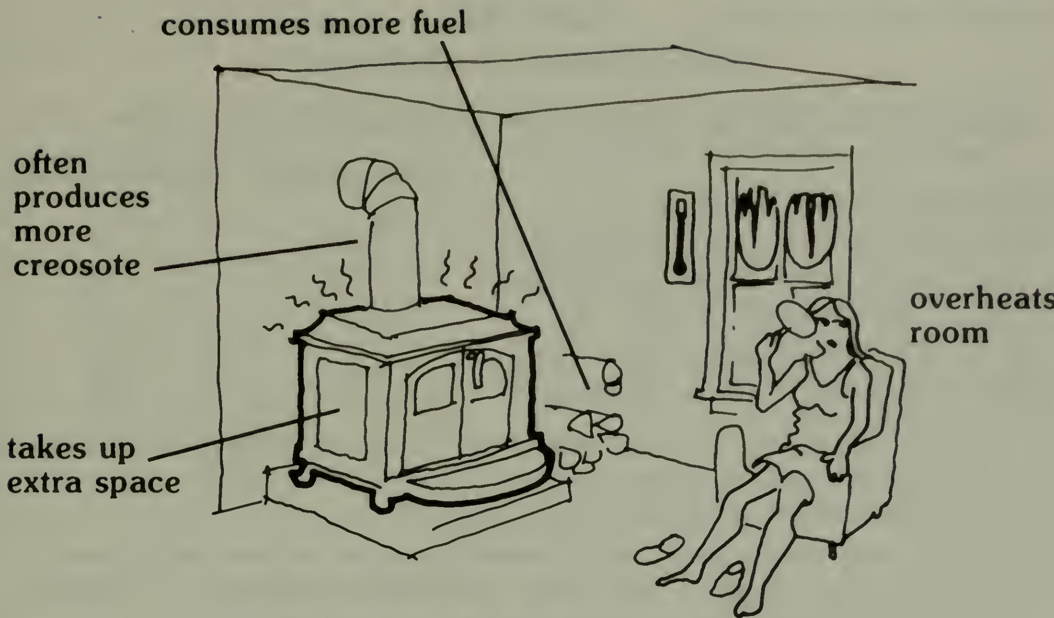
Note: Figures assume wood costs $100 per cord; that a chimney cleaning costing $50 is done annually or every 3 cords; and that a 25% increase in efficiency cuts creosote and the need for chimney cleaning in half.

Ease of Operation

If you find your stove awkward and inconvenient to use, chances are it will get used infrequently. As you look at stoves, consider how easy they will be to operate. Is the loading door big enough to make loading wood easy? Are the air inlets in a convenient location and are they easy to adjust? Does the stove include an ash drawer or other features that make ash removal easy? If you are planning to use your stove for long overnight or all-day burns, is the firebox big enough and the stove massive enough to burn efficiently for long periods of time without tending? If you are purchasing a stove with glass doors, does it have special design features to help keep smoke from dirtying the glass? Can the glass doors be easily removed for cleaning? Is the exterior surface an easy-to-clean material and are there a minimum of difficult-to-clean cracks and corners? These and other conveniences can make the difference between a stove that is well-used and a stove that just sits and gathers dust.

Sizing

Choosing the right size stove for your home depends on two factors: the heating needs of your chosen space, and the heat output of the stove. Stoves need to be correctly sized to provide adequate heat to the rooms you want to heat; a stove that is too big results in overheating, excess fuel consumption, high creosote production, and increased emissions of air pollutants. Generally, stoves run most efficiently when they are fairly hot. To choose an oversized stove and then run it cool or "damped down" is a mistake because it will consume more fuel, produce a lot of creosote, be a significant source of air pollution, and may still overheat your house.



Problems with an Oversized Stove

Stoves vary widely in the amount of heat they put out. As a general rule, the heat output of the stove is directly related to the size of the stove, but do not underestimate the amount of heat a small stove can produce. Many manufacturers rate their stoves by the number of cubic feet they claim it is able to heat, but a stove's ability to heat a given room is affected by the configuration of the room, how well weatherized it is, the temperature outside, the type of wood being burned, and several other factors. For these reasons, cubic feet figures are more often misleading than helpful.

More useful is a rating of a stove's output in Btu's/hour. A Btu (*British thermal unit)* is a unit of measurement commonly used for measuring heat output. One Btu is the amount of energy needed to raise the temperature of one pound of water one degree Fahrenheit. To obtain Btu/hour data on the stoves you are considering, consult your stove dealer. Make sure your dealer gives you figures for normal home-operating conditions and not special laboratory-testing conditions.

If you are using your stove as the sole source of heat for a portion of your house, it must be large enough to provide adequate heat on the coldest days of the year. However, if you have backup heat, your stove should be a little smaller. A stove sized for the coldest days of the year will be oversized for normal winter temperatures. A slightly undersized stove will be able to handle all but the coldest days (your backup system can provide a boost on these days), but it will burn more efficiently and cleanly all winter long.

To estimate the optimal heat output for your stove, measure the floor area of the rooms you want your stove to heat (width times length equals floor area). Next, look at Table IV and pick out the row and column that best describes your home and needs (in some cases you may want to average two numbers). Finally, you can estimate the optimal heat output for your needs (in Btu's/hour) by multiplying the floor area times the number you arrived at in Table IV.

Table IV
Stove-Sizing Guidelines

Heat Needs Per Square Foot of Floor Area (in Btu's / hour)*

	Weatherized**	Unweatherized***
Backup heating system available:		
Eastern Mass. and Southern New England	15	37
Western Mass. and Northern New England	20	50
No backup heating system:		
Eastern Mass. and Southern New England	20	50
Western Mass. and Northern New England	25	65

* *These figures assume a ceiling height of 8 feet. If your ceiling is approximately 12 feet tall, multiply these figures by 1½ and if your ceiling is approximately 16 feet tall, multiply these figures by 2.*

** *A weatherized house is assumed to have storm windows or double-paned windows and 10 inches of fiberglass insulation in the ceiling and 3½ inches of fiberglass insulation in the walls.*

*** *An unweatherized house is assumed to have no insulation, storm windows, or double-paned windows.*

Example: Mr. and Mrs. Brown, who live in western Massachusetts, want to buy a wood stove to heat their living room and adjoining kitchen and study. The living room measures 15 feet by 25 feet, the kitchen measures 15 feet by 20 feet, and the study measures 10 feet by 15 feet. Their house is weatherized, and they have a conventional heating system that can heat these rooms.

1. The Browns compute the floor area of the three rooms:
   $(15 \times 25) + (15 \times 20) + (10 \times 15) = 825$ square feet
2. The Browns look at Table 4, choosing the row for "backup heating system available, western Mass." and the column for "weatherized rooms". They circle the number "20" where this row and column intersect.
3. The Browns compute their heating needs:
   825 square feet × 20 Btu's/sq. ft. = 16,500 Btu's/hour

The Browns decide to buy a stove that can supply 16,500 Btu's/hour.

Aesthetic Considerations

In addition to providing heat, a stove can be an important decorative element in your house. If your stove matches your home's decor, it can increase your satisfaction; a stove that doesn't match can be a source of dissatisfaction. Stoves come in many designs, shapes, and colors. Choose a design that suits your tastes. As discussed previously, the material from which a stove is made affects how it looks.

Many manufacturers now paint their stoves in a variety of colors — steel stoves can be painted with a high temperature paint and cast iron stoves can be covered with a baked-enamel finish. Enamels provide a durable, lasting, and easy-to-maintain finish that holds its luster indefinitely. Paint

and enamel finishes generally cost a little more — it's up to you to decide whether the extra cost is worth it.

Another aesthetic consideration is whether to get a stove with glass in the front door. Glass doors allow you to view the fire without opening the doors (opening a stove's doors to view a fire significantly reduces stove efficiency). However, smoke from a fire can build up on the glass, necessitating frequent cleaning. More and more stoves are now available with "clean glass" that stays clean due to *air-wash systems* which send a jet of air along the glass, keeping smoke away. With coal stoves, glass allows you to easily check if the fire is burning properly. Glass does not soot-over when coal is burned.

Cost

Solid fuel heaters range considerably in price ($400 to $2000) depending on the size, the materials used for construction, the quality of manufacture, and options you may choose such as enamel finishes, glass doors, multi-fuel burning equipment, catalytic enhancements, and decorative brass features. Also, stove features can affect installation costs. For example, 8 inch chimneys (required for some stoves) are considerably more expensive than 6 inch chimneys (sufficient for most stoves).

It is probably more true with stoves than with a lot of other products that you get what you pay for. By shopping around or waiting for a special sale you may enjoy some worthwhile savings. However, if you buy an unknown brand at an unusually low price you may be sorry. Remember that any stove has to contain exceptionally intense heat — often over 1200 degrees — for many years. An inexpensive stove that falls apart after a few years is a very poor bargain.

Manufacturer Reliability

A final consideration in choosing a stove is information about the manufacturer and stove dealer. Are they stable companies? How long have they been in business? Do they have a good reputation? Try to talk to other people who have used the stove you are about to buy, and who have purchased a stove from your dealer. If you cannot get references, you should be suspicious.

How good is the warranty? Cast iron and soapstone stoves should be guaranteed for at least three years. Steel stoves should be guaranteed for five years.

Are replacement parts available? Even the best stoves need occasional repairs. Handles break, gaskets wear out, coal grates can warp, firebrick lining can crack, cast iron burn plates and baffles wear out and need replacement, and you might even put your poker through the glass door. If replacement parts are not available, you may prematurely need a new stove.

When repairs are needed, must you ship your stove to the manufacturer or can your local dealer handle repairs? Working with a local dealer is generally simpler than working with a distant manufacturer. Select a manufacturer and dealer you can rely on to provide parts and prompt repairs.

INSTALLING A STOVE

The basic rule for installing a stove is follow the manufacturer's installation instructions (generally found on a metal tag attached to the back of the stove). These safety guidelines may seem unnecessary, or they may interfere with your plans for the stove, but their importance cannot be overemphasized. There are over 100,000 wood heat-related fires in the U.S. annually; approximately 90% result from faulty installation and upkeep. The guidelines provide reasonable but not extreme margins of safety. Don't guess or compromise where your safety is concerned.

Clearances

The sides and bottom of a wood stove, and the stovepipe that connects the stove to the chimney, get very hot, which can cause nearby combustible materials, such as unprotected walls and floors and fireplace mantles, to dry out and eventually catch fire. To protect against this danger, follow the UL label on the back of your stove that specifies how much space you must leave between the sides, top, back, and stovepipe of your stove and nearby combustible materials. The label also specifies how far a fireproof hearth (placed under the stove) must extend in each direction.

Just about all stoves sold since 1977 have labels with clearance information. If your stove does not have a label, several of the books listed under "For More Information" contain installation instructions. The drawing on the next page illustrates how to interpret the information on the label for one particular stove model. The distances shown in this drawing will probably be different from the distances specified on the label for your stove.

These clearances are for all combustible materials. This includes not only wall surfaces, but stacks of wood, piles of newspaper, and the sofa you were going to put "temporarily" next to the stove. It may be difficult to install your stove where it will be convenient, attractive, and safe, but don't compromise. It has to be right the first time.

Stovepipe: There should be at least 18 inches of space between a single-wall stovepipe and any combustible material. With double-wall stovepipe (a stovepipe within a stovepipe with an air space in between), a minimum clearance of 6 inches is generally acceptable, but check with the stovepipe manufacturer or seller first.

Reducing Clearances: Minimum acceptable clearances can be reduced if a *noncombustible wall protector* is placed between the side and top of the stove and stovepipe and any nearby combustible material. Table V lists types of wall protectors and the amount of clearance reduction each allows. Drywall (the plaster-like boards used to cover the walls and ceilings in many homes) **cannot** serve as a clearance reducing wall or ceiling protector.

UNDERWRITERS' LABORATORIES

LISTED

SPACE HEATER
(SOLID FUEL FIRED)

INSTALL IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. WHEN INSTALLED ON A COMBUSTIBLE FLOOR, A NONCOMBUSTIBLE PROTECTOR WITH A MINIMUM THICKNESS 3/8 INCH (OR 1/4 INCH WHEN COVERED WITH SHEET METAL) IS REQUIRED UNDER THE HEATER AND EXTENDING A MINIMUM DISTANCE OF 18 INCHES (A) TO THE FRONT AND 8 INCHES (B) TO THE SIDES AND REAR.

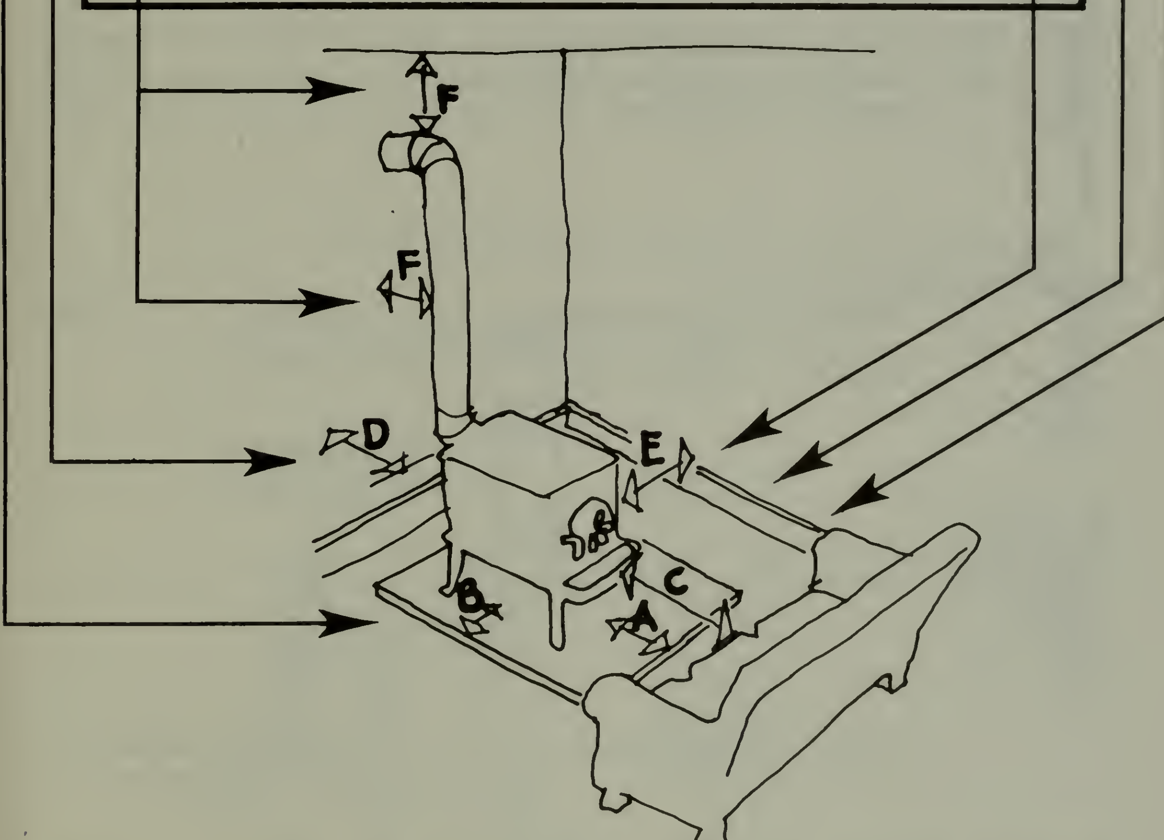
MINIMUM CLEARANCES TO COMBUSTIBLES

C. FRONT .... 48 INCHES
D. BACK .... 30 INCHES*
E. SIDES .... 24 INCHES
F. FLUE PIPES .... 18 INCHES*

DO NOT OBSTRUCT SPACE UNDER HEATER.
*FOR REDUCED BACK AND FLUE PIPE CLEARANCES, SEE PRINTED INSTRUCTIONS.

WARNING

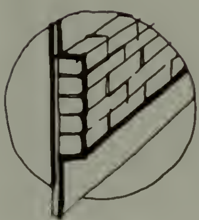
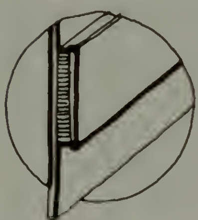
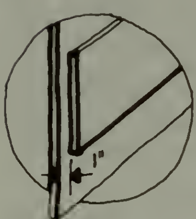
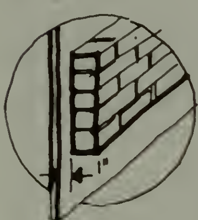
BURN WOOD ONLY.
DO NOT USE COAL OR OTHER FUELS.
OPERATE ONLY WITH REFRACTORY BRICKS, BOTTOM HEAT SHIELD AND 6" LEGS IN PLACE.
READ OPERATING INSTRUCTIONS CAREFULLY.
ALWAYS PROVIDE A SOURCE OF FRESH AIR INTO ROOM.



Minimum Clearances to Combustibles from a Sample UL Label

In Table V, clearance reductions are specified as percentages. For example, if your stove requires a 36 inch clearance between the sides of the stove and combustible materials, and if you install a 3½ inch masonry wall without ventilation as a wall protector, then Table V specifies you may reduce the minimum clearance distance by 33%. With the wall protector, the minimum clearance can be reduced by 12 inches (36 inches × 33%), resulting in a new minimum clearance of 24 inches (36 inches − 12 inches).

Table V
Maximum Allowable Clearance Reduction With Protection Between the Stove and Combustible Materials

		Clearance Reduction Allowed	
	Type of Protection	**Walls**	**Ceilings**
	3½″ masonry wall — no ventilation	33%	—
	½″ non-combustible insulation board over 1″ glass fiber or mineral wool batts — no ventilation	50%	33%
	Minimum 24 gauge sheet metal spaced out 1″ to allow ventilation behind	66%	50%
	3½″ masonry wall spaced out 1″	66%	—
	Listed prefabricated systems	Per manufacturer's specifications	

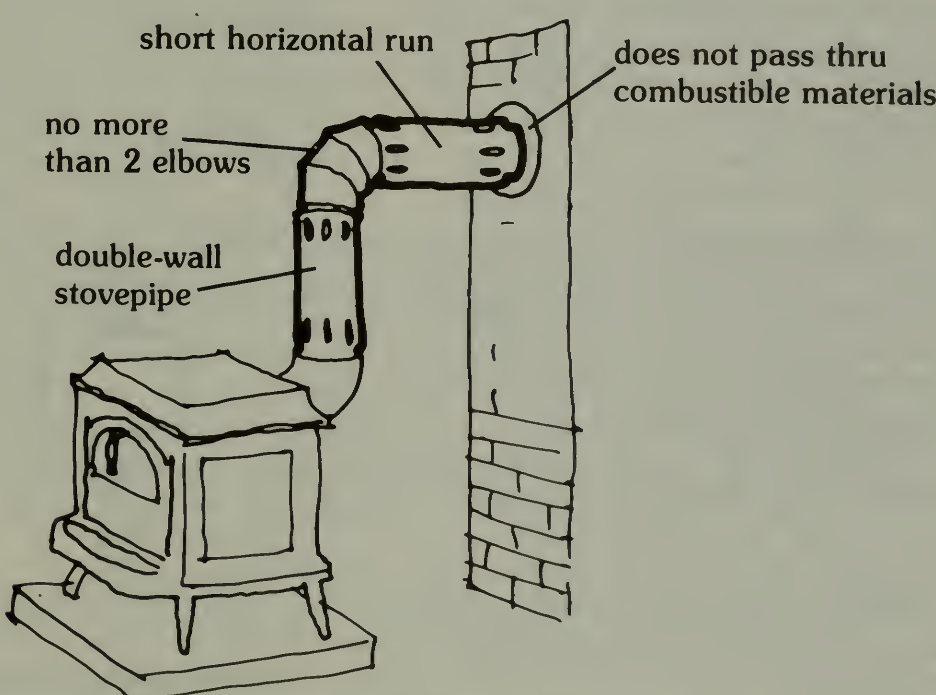
Hearth

A hearth protects the floor beneath a stove from heat radiating from the stove and from sparks or coals that may accidentally fall out of the loading door. A hearth may be purchased pre-made or you can build one yourself using a UL approved hearth material such as "Wonderboard" or "Durarock". Tiles or other noncombustible materials may be put over the approved hearth material, but tiles by themselves are not UL approved. Hearths must extend outwards from the stove in all directions. The label on the back of your stove will specify how far out your hearth must extend.

Stovepipe

A piece of stovepipe, ideally one that is double-walled with a stainless steel liner, should be used to connect your stove to your chimney. A single-wall stovepipe, 24 gauge or thicker, can also be used. A double-walled stovepipe is more expensive, but promotes better draft, decreased production of creosote and pollutants, and increased efficiency. The stovepipe should not be galvanized. When galvanized metal is exposed to high temperatures, it can release hazardous materials such as zinc and lead into the air.

Stovepipe should not pass through walls and ceilings. If you need to pass through a wall or ceiling, you should use an insulated chimney instead of a stovepipe. To ensure a good draft, you should not have more than two 90-degree turns in the stovepipe, nor should horizontal stovepipe runs be more than 6 feet. Stovepipe pieces should be fitted together tightly then permanently joined with three sheet metal screws to prevent the stovepipe from being shaken apart in the event of a chimney fire.

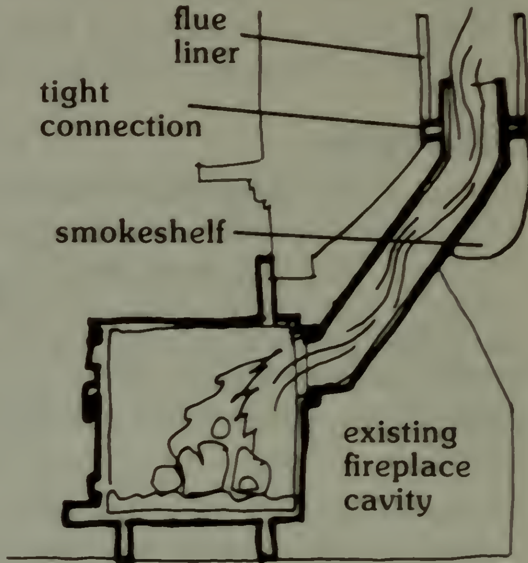


Proper Stovepipe Installation

Chimney Connections

The stovepipe can either be connected directly to a prefabricated chimney, it can be inserted into an existing chimney through the fireplace, or it can be run through the wall of a masonry chimney. To connect a stovepipe to a prefabricated chimney, follow the directions that come with the chimney.

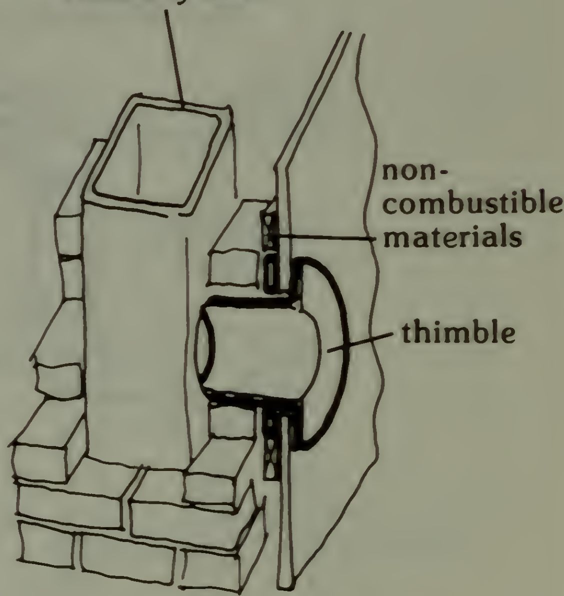
If you are venting your stove through an existing fireplace, be sure to run the stovepipe up through the damper to the beginning of the flue liner, above the smokeshelf (see drawing). The stovepipe should be connected tightly to the flue and not just left to dangle unconnected. If you do not have a tight flue connection, you will get diminished draft and heavy creosote buildup.



Installing a Stove in an Existing Fireplace

Some fireplace installations bypass the damper altogether and enter into the flue liner above the level of the damper by cutting through the masonry wall of the chimney. In cases such as this, it is important that the fireplace damper is sealed shut to prevent the intake of the room air that will steal heat from your house and reduce chimney draft.

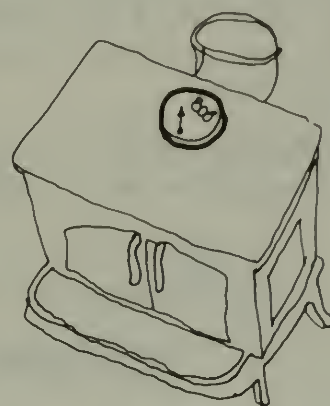
Connecting a stovepipe directly through the wall of a masonry chimney involves several steps. First, a hole is carefully cut through the wall of the chimney, using special care not to crack the clay chimney liner. Next, a *thimble* (a round clay piece that holds the stovepipe snugly) is cemented into this hole with high-temperature cement. Finally, the stovepipe is passed through the thimble. The stovepipe is not cemented in place, so it can be easily removed for cleaning and replacement. Both the thimble and the stovepipe should extend to the inside surface of the chimney liner, but they shouldn't extend into the flue opening at all.



Stovepipe to Masonry Chimney Connection

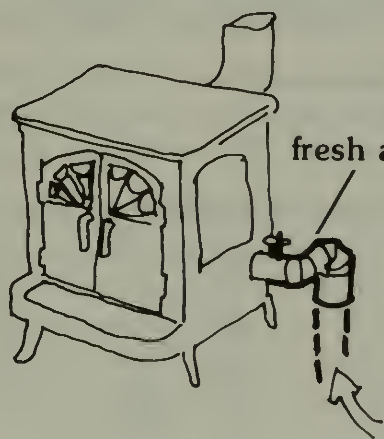
Other Important Issues

Stove Thermometer: A stove thermometer should be attached to your stove so you can monitor the intensity of the fire in the stove. Too hot a fire can be dangerous, and too cool a fire results in inefficient combustion and heavy creosote production. *Surface thermometers* placed directly on the top of the stove provide the most useful information. Tests have shown that a 500° F surface temperature generally means the firebox temperature is 1000° F (hot enough to promote secondary combustion). You should generally try to maintain surface temperatures over 500° F; if the surface temperature is below 500° F, it is either time to refuel, or to open the air inlets a little more. *Stack thermometers*, which attach to the stovepipe with either a magnet or stem, are not as useful as surface thermometers because the draft up the stovepipe and the amount of soot on the inside of the stovepipe cause the stovepipe temperature to vary.



Surface Thermometer

Indoor Air Quality: When a fire burns, it consumes oxyen. In most houses, this oxygen is supplied by fresh air that leaks into the house through numerous cracks, such as those around windows and doors. Some newer houses are constructed very tightly in order to keep heating bills low. In these houses, a small duct should be installed to bring fresh air from outside directly to the fire (see drawing). Some stoves have a special collar to allow easy installation of a fresh air duct.



Wood and coal stoves give off pollutants. While most of these pollutants go up the chimney, some pollutants generally do enter your house. In normal houses, which let large amounts of fresh air leak in, indoor pollution from wood and coal stoves does not appear to be a major problem. In tightly-sealed houses, less fresh air leaks in and the indoor air becomes stale. In these houses, ventilation should be installed that steadily exhausts some of this stale air, keeping pollutant levels from building up (for more information on ventilation methods, see our SUPERINSULATION booklet).

Do-It-Yourself or Not?: For most people, installing a stove and chimney is a job worth having a qualified installer do (usually chimney sweeps do this work). Although most operations are straightforward and all stoves and chimneys today come with explicit instructions, it is still an undertaking

where mistakes are expensive and potentially dangerous. When selecting a stove installer, get bids and references from several contractors before selecting one for the job.

Inspection and Insurance: Most states and towns require that you obtain a building permit before installing a stove and that you have the installation inspected when all work is completed. You should also check with your insurance company to see what their requirements are. Usually the insurance company wants a copy of the town's approval. Inspections help insure you a safe installation and besides, if you ignore inspection requirements, your insurance company can cancel or not honor your fire insurance policy.

Fire Extinguisher: You should always have a Type AB fire extinguisher in an accessible place near your stove.

UPGRADING YOUR STOVE

If you have an old stove, there are several things you can do to make it burn more efficiently and cleanly, and heat your home better.

Stove Thermometers: Thermometers should be installed on all stoves—they make it easier to monitor the fire, so optimal burning conditions are maintained. See "Stove Thermometers" on page 34 for more information.

Improve Heat Circulation: Many stoves inadequately heat a house because of poor heat circulation. See the "Moving Heat" section, page 14, for suggestions on how to improve the circulation of heat from your stove. Another way to make the heat produced by your stove go farther is to weatherize your house. If you weatherstrip, caulk and insulate your house, heat produced by your stove will stay inside longer (see "Weatherize First," page 18).

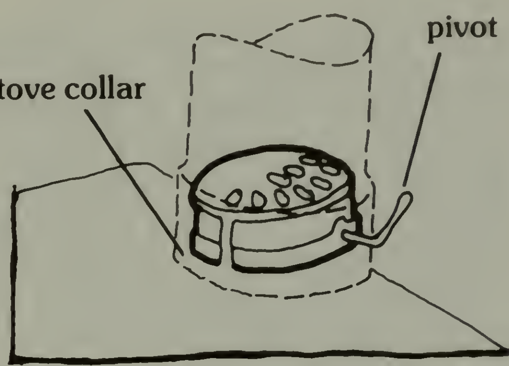
Double-Walled Stovepipe (wood only): The stovepipe connecting the stove to the chimney generally deteriorates after a few heating seasons. The next time your stovepipe needs replacement, consider installing a double-walled stovepipe with a stainless steel liner (see "Stovepipe," page 32).

Catalytic Combustors (for wood stoves only): Catalytic combustors promote complete combustion, reducing the amount of fuel burned while also reducing creosote and pollutant production. Catalytic combustors are available that can be retrofit onto most existing stoves. They generally cut fuel comsumption by 10-25% and creosote production by 50-80%. Retrofit combustors generally cost $100-$300, but if you burn more than 1-2 cords of wood a year, savings in fuel and chimney cleaning costs will pay back your investment in just a few years.

A catalytic combustor is only as good as the amount of surface it exposes to unburned gases. Generally, the more surface area the better. Avoid combustors that are less than an inch thick. They may be inexpensive, but they also are not very effective. With a combustor, you are essentially buying platinum or palladium. There are no shortcuts here.

One caution: Since the operation of any combustor depends on the flue gases moving through it, it does require a fair pull of draft in order to work. If you have a weak draft, then you may not be able to use a retrofit combustor.

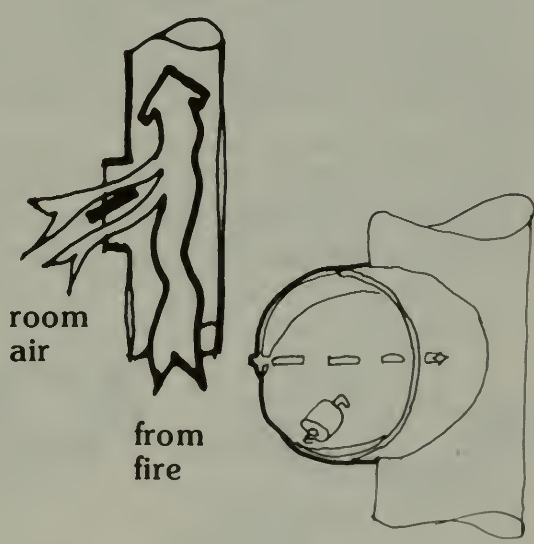
Look for a combustor that can be pivoted so it doesn't fully block the flue pipe (see drawing). In normal operation it should block the flue pipe, but when you open the stove doors, it helps to pivot the combustor out of the way to temporarily increase draft and decrease the chances that smoke will enter your house.



Retrofit Catalytic Combustor

Make sure you can mount a combustor in the collar of your stove, right where the stovepipe connects to the stove (see drawing). The effectiveness of a combustor goes down with increasing distance from the fire. For more information on combustor use and maintenance, see "Using a Stove," page 37.

Barometric Draft Control (coal stoves): Coal fires are very sensitive to fluctuations in draft. If your chimney has a strong draft, you can improve combustion and decrease the loss of hot air up the chimney by installing a barometric draft control. A barometric draft control lets room air into the flue in proportion to the strength of the draft (see drawing). The draft through the fire remains nearly constant, improving combustion. Air movement from the stove up the chimney is slowed, decreasing heat loss up the chimney.



Barometric Damper

Barometric draft controls should not be used with wood stoves because wood stoves produce creosote, which can cause a chimney fire. In the event of a chimney fire, air can rush in through the barometric damper, intensifying the chimney fire.

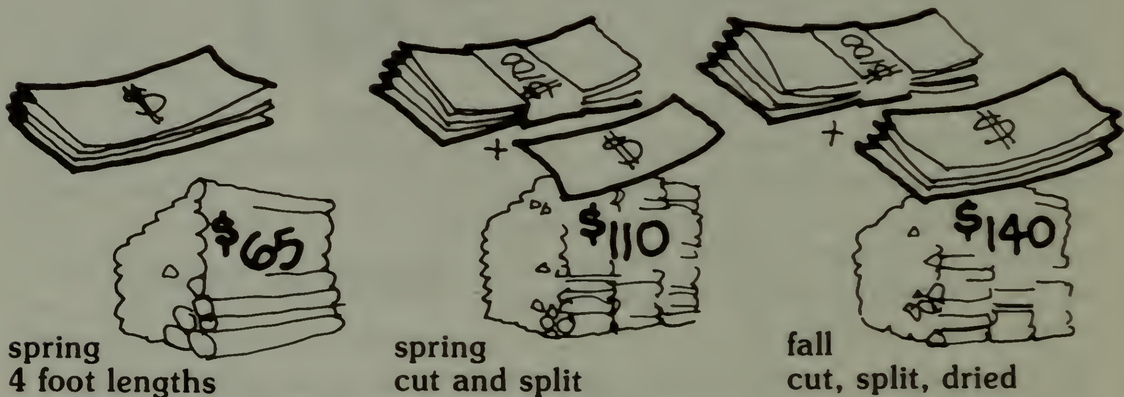
USING A STOVE

Obtaining Fuel

Wood: There are a number of ways to obtain fuelwood, from cutting it yourself to having it delivered in neatly-split, stove-length pieces. Cutting your own wood is least expensive, but it requires a major investment of time and labor. If you're interested, there are good books available on wood-cutting and woodlot management — see the "For More Information" section at the back of this booklet. Most stove owners, however, wind up buying their wood from a dealer.

Wood is sold by the cord. A cord is a tightly-stacked pile of wood measuring 4 feet high by 4 feet wide by 8 feet long. You should buy your wood from someone reliable — especially if you are buying wood that has been cut, split, and/or seasoned (dried). The best advice is to shop around until you find a supplier who is reliable and with whom you are satisfied. Avoid anyone trying to sell you an undefined or incorrectly-defined amount of wood. A "truckload" is a vague term that depends on the size of dealer's truck. A full-size pickup will hold only half a standard cord . Beware of what a dealer claims to be "about" a cord, delivered in a half-ton pickup truck. If you have any doubts about its real volume, stack the wood before you pay. Most dealers are local people who have a reputation to protect, and they'll correct substantial shortages. If you have a problem, call your state's consumer protection department.

The price you pay for wood will depend to a large degree on when you buy your wood and in what state of preparation you buy it. If you buy wood in the spring, when it is still green, you will pay much less for it. If you buy wood in 4 foot lengths and cut and split it yourself, you will save a great deal of money. On the other hand you pay for "processing." You pay to buy it already cut into stove-length logs. You pay to buy it split. You pay to buy it seasoned. The happy medium for many people is to have wood delivered in green (unseasoned) 4 foot lengths so they can then cut it and split it themselves. This involves about 8 hours of work per cord, but will typically save $50 a cord.



Wood Price Varies with Season and Degree of Preparation

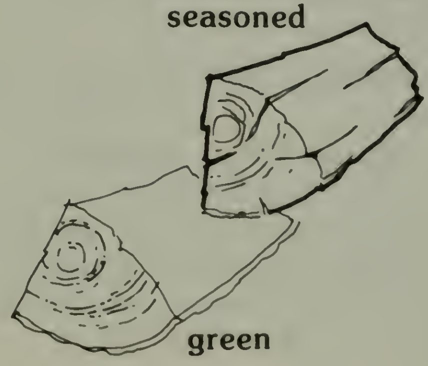
The price you pay for wood will also depend on whether the wood is *hardwood* or *softwood*. Hardwood comes from deciduous trees (those that drop their leaves in the fall) such as maple, oak, birch, beech, and hickory. Softwood comes from evergreen trees (trees with needles that keep their needles all year long) such as pine, spruce, hemlock, and fir. A cord of hardwood typically provides about ⅓ more heat than a cord of softwood. For this reason, hardwood generally costs ⅓ more than softwood. Softwood tends to ignite more quickly, which makes softwood preferable for kindling and starting fires. Many people use softwood to start a fire, heating up the stove and room, and then add hardwood for a long, steady burn.

Coal: Coal is generally sold by the ton and delivered to your house in a large truck. While you can buy coal in small bags from many hardware, stove, and other retail stores, purchasing coal in this way can be very expensive. For home use you should always buy *anthracite* coal — a very hard coal with a high heat content and a low ash content. *Bituminous* coal has a much lower heat content, much higher ash content, and emits more pollutants when burned. Bituminous coal should be avoided for home use. Athracite coal can be bought in different size pieces. Check your owner's manual or check with your stove dealer to determine which size coal you need. Most home stoves generally burn *nut* size coal (pieces between 13/16 inches and 1-5/8 inches in diameter) or *pea* size coal (pieces between 9/16 inches and 13/16 inches in diameter).

Seasoning and Storing Fuel

Wood: Approximately 30%-60% of the weight of a green piece of wood is moisture. At this moisture level, over 15% of the heating value of the wood is lost because heat from the fire is wasted driving-off the excess moisture. In addition to losing heating value, if you burn green wood, the fire will burn cooler, which can cause creosote and pollutant production to increase.

Once wood is cut, it begins to *season* (dry). Seasoning can be accelerated by cutting the wood into stove-length pieces and splitting it while it is still green. To season your wood, stack it in a dry, sunny place. Stack it so air can pass through and carry moisture away. Cover the top of the wood with a piece of plastic so rain doesn't soak the wood, but leave the sides uncovered so air can get in. If you start seasoning your wood in the spring, it will generally be dry enough to burn the following winter. Generally, seasoned wood will have cracks in the ends of the logs (see drawing). If you buy your wood, the only way to be sure it is seasoned is to buy it in the spring and season it yourself. Come winter, you can leave most of your wood outside as long as the top is covered. It often helps to keep a little wood inside — enough for the next fire or two.



Coal: Most coal users store their coal in a wooden bin. A 4-foot by 4-foot by 8-foot bin will generally hold 3 to 4 tons. A 55 gallon drum will hold roughly 250 pounds — 1/8 of a ton. Your storage area should be accessible to a delivery truck. Because coal is dusty and dirty, you should store it away from living spaces, but near the stove. Basements, garages, and nearby sheds are all good places to store coal. Coal does not need to be dried or seasoned. Unlike wood, coal does not need air circulation around it. However, coal should be protected from rain and snow. Wet coal does not burn as well as dry coal, and coal pieces that are frozen together are not easy to shovel.

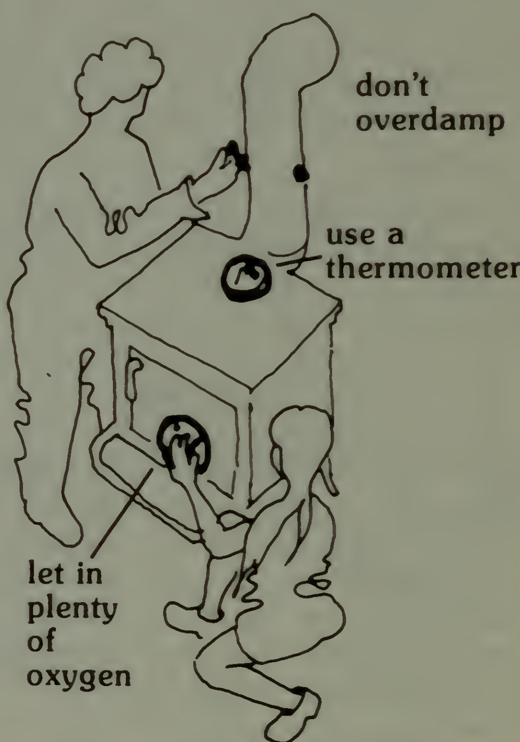
Burning

Wood

Starting a Fire: To start a fire in your stove, start with very small thin sticks of dry wood that will catch fire easily. Softwoods are good for starting fires. Group the sticks loosely together; tight enough so heat from one stick will reach other sticks, but loose enough so plenty of air can get in. Before you light the fire, fully open the air inlets and damper on your stove. Once the fire catches, gradually add more wood, starting with small sticks and moving to larger and larger pieces of wood. Small pieces of wood will create enough heat so medium-sized pieces can burn and medium-sized pieces will create the coals that are needed to support combustion in logs. Once the fire is going, let it burn briskly for about 20 minutes so a hot bed of coals is established. It is during the first stages of burning that wood releases most of its gases; a hot fire will insure that the gases are burned.

What Not to Burn: Don't burn trash, newspapers, painted wood, chemical chimney-cleaners, fire colorants, or lighter fluid. Chemicals in these materials can "poison" catalytic combustors so they won't work properly and smoke from many of these materials can be harmful to human health. Smoke from burning colored newspaper and painted wood is particularly harmful to human health; these materials should **never** be burned.

Maintaining a Fire: Make sure the fire has plenty of oxygen. A damped down, air-starved fire produces a long, smoldering, inefficient, creosote-producing burn. If you want the fire to last a number of hours without having to tend it, the key is to build up a good initial bed of



Maintaining a Fire

coals. If you want to run your stove overnight, try to adjust your burn cycle so that you're ready to refuel the stove at least an hour before going to bed to ensure that gases are burned and coals established.

Keep an eye on your stove thermometer. If the stove starts cooling down significantly, it's time to add more wood or perhaps to open the air vents a little. When you add wood to the fire, open the air vents so the fire gets plenty of air. Again, let it burn briskly for about 20 minutes. Don't crowd too much wood in the firebox — leave some room for air to circulate.

Catalytic Combustors: If your stove has a catalytic combustor, **never** burn any of the materials listed in the "What Not to Burn" section above. Smoke from these materials will harm your catalyst.

Before you open up the door on a catalytic stove, swing the catalyst out of the way, or open up the *bypass damper* (a damper found on some catalytic stoves that lets smoke pass around the combustor) so you get a good draft and prevent smoke from entering your house. Once the door is closed, swing the catalyst back into place, or close the bypass damper. If you don't poison your catalyst, it will generally burn about 15 cords of wood before it needs replacement. You can purchase replacement catalysts without having to purchase a whole new combustor.

Ash Removal: With any wood stove, you'll need to periodically remove the ashes before the ashes start blocking air movement inside the stove. Use an ash shovel to put the ashes into a heavy metal container. Don't ever empty the ashes into a cardboard box or paper bag. Insulated by the ashes, coals can stay red hot for 2 or 3 days after the last fire goes out. Plenty of house fires are caused each year by people who empty the ashes from their stoves into a combustible container. Get a good non-combustible container and use it. Wood ashes are a good fertilizer, provided you don't burn garbage, newspapers, or painted wood in your stove (chemicals in these materials can be harmful to plants).

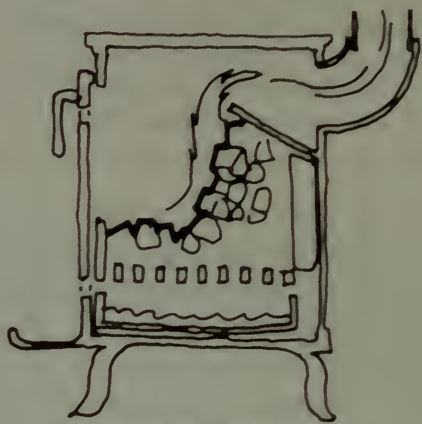
Coal

Starting a Fire: All coal fires must be initially started from the coals of a wood fire. Get a wood fire burning well following the procedures discussed in the "Wood" section above. After about 20 minutes, when the fire is burning briskly, add a layer of dry, room-temperature coal, making sure to leave visible red spaces between the pieces of coal. Adding the coal too soon, or adding too much coal can smother the fire. Leave the primary, secondary, and stovepipe dampers open until this initial load of coal has definitely ignited and started to glow. When the coal has ignited, blue flames will appear above the bed of coals.

Once the coals are burning well, the primary and secondary air inlets should be only slightly open to permit slow combustion. There should always be a small blue flame above the coalbed to indicate all gases are being completely burned. If there is no blue flame, open the secondary air inlet a little.

When you first start a coal fire, or when few coals from an old fire are left, you should add coal in small batches, making sure to always leave a portion of red-hot coals exposed on top (these exposed red-hot coals are needed to burn gases that are generated in the combustion process). Before opening the stove door, to prevent harmful gases from entering your house, open the air inlets to allow the fire to pick up a little and burn off any remaining gases. After refueling, keep the air inlets open until all coals are red hot.

Long Burns: To prepare the fire for a long, slow burn, draw the red-hot coals to the front of the firebox and bank (heap) fresh coal up the sides and back of the stove. Allow the fresh fuel to establish itself, then adjust the air inlets for a slow burn.



Banking Coal

Ashes: About twice a day you'll need to shake the coal grates to knock ashes down into the ash pan. If you don't shake the grate periodically, ashes will build up and impede airflow into the firebox, eventually causing the fire to go out. Shaking the grate too much, however, wastes fuel and can cause damage to the stove. When shaking, shake well until some substantial-sized pieces of live coal pass through the grate, and until the entire fuel bed is essentially free of ash. Remove the ash from the ash pan using the same precautions discussed above for wood. Coal ash should not be used as fertilizer since materials in the ash are hazardous to plants.

CHIMNEY FIRES

Chimney fires occur when creosote deposits in your stovepipe and chimney ignite and burn. During a chimney fire, temperatures up to 2100°F can be reached, which can cause extensive damage to your chimney, and can lead to the fire spreading to the rest of your house.

To prevent chimney fires, inspect your chimney regularly for creosote and clean the chimney when there is more than ¼ inch of creosote anywhere in the chimney or stovepipe. Use clean burning habits — don't burn green wood and don't damp-down your stove too much. Green wood and low-oxygen combustion can increase creosote production. Inspect your chimney regularly for signs of wear; repair or replace parts as needed.

If, despite these precautions, you do have a chimney fire, your safety could depend on knowing what to do. Once a chimney fire starts, its easy to recognize — it sounds like a blowtorch, the stovepipe will rattle and turn red hot, and a plume of smoke and fire will stream out of the top of your chimney.

In the event of a chimney fire, you should do five things:

1. Cut off the air supply to the fire by closing all air vents and dampers on your stove. If your stove and installation are tight, you will starve the chimney fire of air, and it will go out in a matter of minutes.

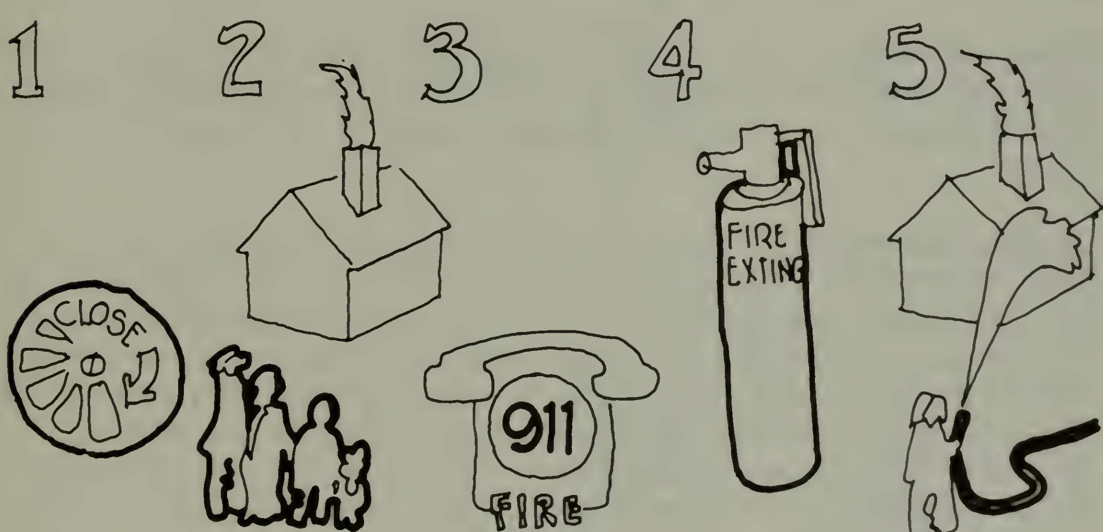
2. Make sure everyone is out of the house.

3. Call the fire department.

4. Use a fire extinguisher in the stove (if cutting off the air supply doesn't put the fire out). You should have a Type AB fire extinguisher near the stove at all times. Aim the extinguisher into the stove, above the flames, so the extinguishing chemicals can be carried up into the chimney. Afterwards, shut the doors tightly. Don't worry about putting out the fire in the stove; concentrate on the fire in the chimney. Though a fire extinguisher may not put out a chimney fire, it will slow it down.

5. Keep the fire from spreading. Use a hose, if one is available, to wet down your roof and any adjacent buildings to prevent them from igniting.

Once the fire is out and before using your stove again, check the chimney very carefully for signs of damage. A chimney fire can cause cracks in a chimney and its lining. Repair any damage and make sure your chimney is in the best possible shape before using it again.



What To Do in the Event of a Chimney Fire

MAINTENANCE

Check Regularly for Creosote: The most important maintenance task with a wood stove is to regularly inspect the chimney and stovepipe for creosote and to clean them whenever there is more than ¼ inch of creosote anywhere in the chimney or stovepipe. When you first start using a stove, you should check the chimney and stovepipe every two weeks by looking into each with a flashlight and mirror. After a few months, you will determine how fast your chimney collects creosote, and you can adjust your inspection schedule accordingly. In all cases, if you use your stove regularly, you should clean your chimney **at least** once a year. Chimneys hooked up to coal stoves should also be cleaned annually and carefully inspected for deterioration.

Chimney Cleaning: When your chimney needs cleaning, for the first time at least, hire a professional chimney sweep. Watch the work and get an idea of what is involved and what methods work on your chimney. Also, there are some types of creosote deposit that only a professional chimney sweep can handle. After your first cleaning, you can decide if you want to do most future cleanings yourself. Many people clean their own chimney several times during the heating season and hire a chimney sweep to do a thorough annual cleaning and inspection. For a good book on chimney cleaning, see "For More Information."

Check Stovepipe: Your stovepipe should be checked monthly for corrosion, especially at the elbow joints, because the elbows generally corrode first. Stovepipes are made from thin steel and need replacing every 1-5 years.

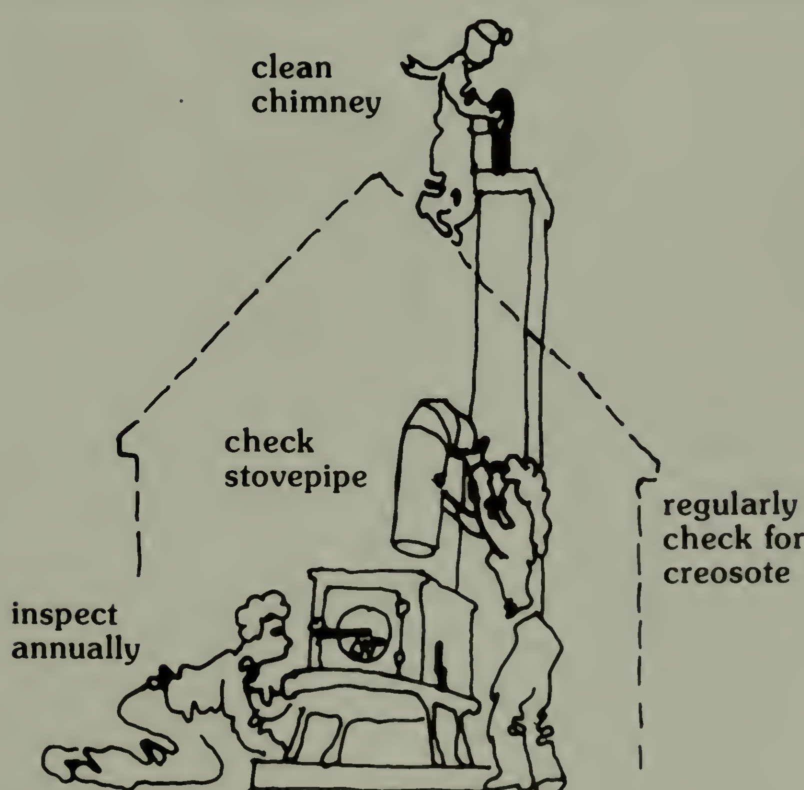
Annual Inspection: You should clean and inspect your entire system, from loading door to chimney cap, once a year. Check the gaskets around the doors, glass, and flue collars of your stove and replace them if they have begun to deteriorate. Check how tightly the door(s) close and adjust them if possible. Check stove panels and parts for cracks and warps. If you find any, repair or replace the damaged pieces. Replace any cracked firebricks. With coal stoves, check the coal grates for warping and replace them if necessary. Check the shaking mechanism and handles to make sure the action is clear. Don't forget to have a chimney sweep clean and inspect your chimney for wear.

Establish a Regular Maintenance Schedule: Maintaining your stove will be less of a nuisance if you establish a regular maintenance schedule. You should design your own schedule to suit your needs; the sample schedule on the next page will give you some guidance.

Sample Maintenance Schedule

When	What	Tools
Every 2 weeks	Check chimney and stovepipe Empty ashes	Flashlight Mirror Shovel Broom Ash bucket
Monthly	Clean chimney Check and clean stovepipe Check and clean catalytic combustor	Chimney brush Handles Dust covers Flashlight Shovel Screwdriver (for pipe) Soft brush
Yearly	Have chimney cleaned Clean stove Inspect system thoroughly Check/replace stovepipe as needed Check/replace door gaskets as needed Make any repairs Buy/split/store cordwood	Same as above plus tools necessary for repairs Bucksaw Ax Splitting maul Wedges Safety Goggles Sawhorse

Besides the tools listed in this maintenance schedule, you will need to have a fire extinguisher, gloves, poker, tongs, and stove thermometer.



Stove Maintenance

FOR MORE INFORMATION

Solid Fuels Encyclopedia by Jay Shelton, 1983. Garden Way Publishing, Charlotte, VT 05445. Expands on all the topics covered in this booklet.

Heating with Coal by John Bartok, 1980. Garden Way (address above).

The Book of Masonry Stoves by David Lyle, 1984. Brick House Publishing Company, 34 Essex Street, Andover, MA 01810.

Be Your Own Chimney Sweep by Christopher Curtis and Donald Post, 1979. Garden Way (address above).

The Woodcutter's Companion: A Guide to Locating, Cutting, Transporting and Storing Your Own Firewood by Maurice Cohen, 1981. Rodale Press, Emmaus, PA 18049.

Working with Your Woodland, A Landowner's Guide by Mollie Beattie, Charles Thompson, and Lynn Levine. University Press of New England, 3 Lebanon Street, Hanover, N.H. 03755.

Practical Homeowner magazine, a monthly journal for home owners on energy saving home improvements including regular features on heating with wood and coal. Published by Rodale Press (address above).

Mass. Audubon Energy Booklets

This booklet is part of a series of low-cost booklets on energy published by the Massachusetts Audubon Society. Other titles in the series are:

- *Weatherize Your Home or Apartment*
- *All About Insulation*
- *Oil and Gas Heating Systems*
- *Solar Ideas for Your Home or Apartment*
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Copies of this *Wood and Coal* booklet, or any of these other booklets, may be purchased from the Public Information Office, Massachusetts Audubon Society, Lincoln, MA 01773, (617) 259-9500.

About the Massachusetts Audubon Society

The Massachusetts Audubon Society is one of the oldest conservation groups in the world and the largest in New England. Massachusetts Audubon's agenda focuses on the protection of wildlife and the natural environment and on the availability of clean water and energy resources. The Society's programs encompass four broad areas: conservation, education, advocacy, and research. Membership in Mass. Audubon is available to everyone, everywhere, who wishes to lend their support to our work.

Credits

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